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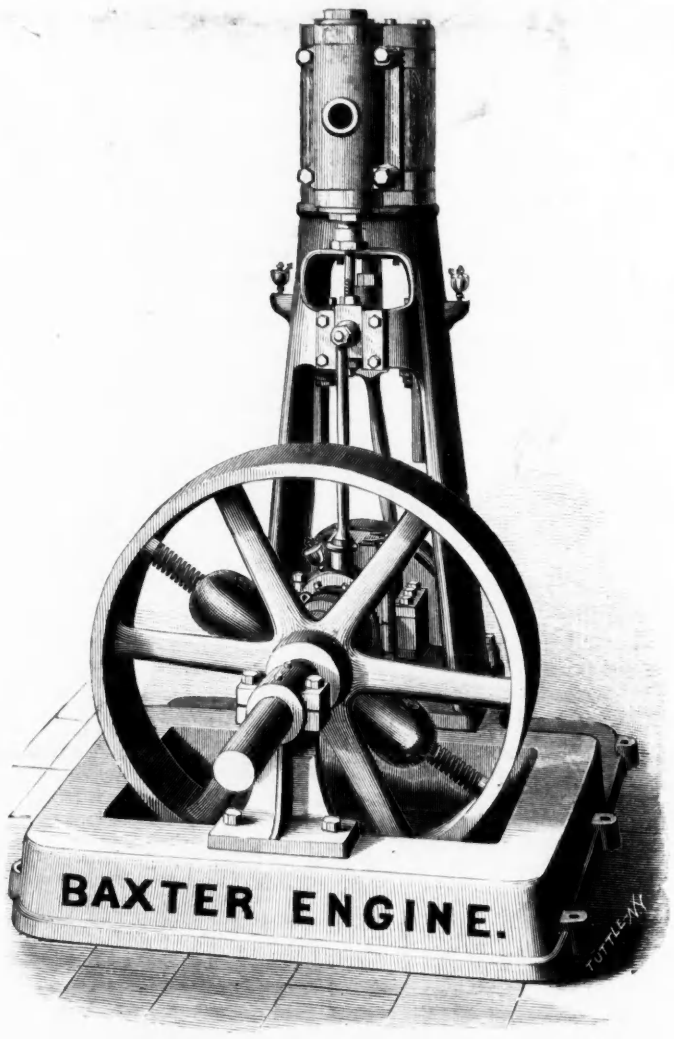
ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

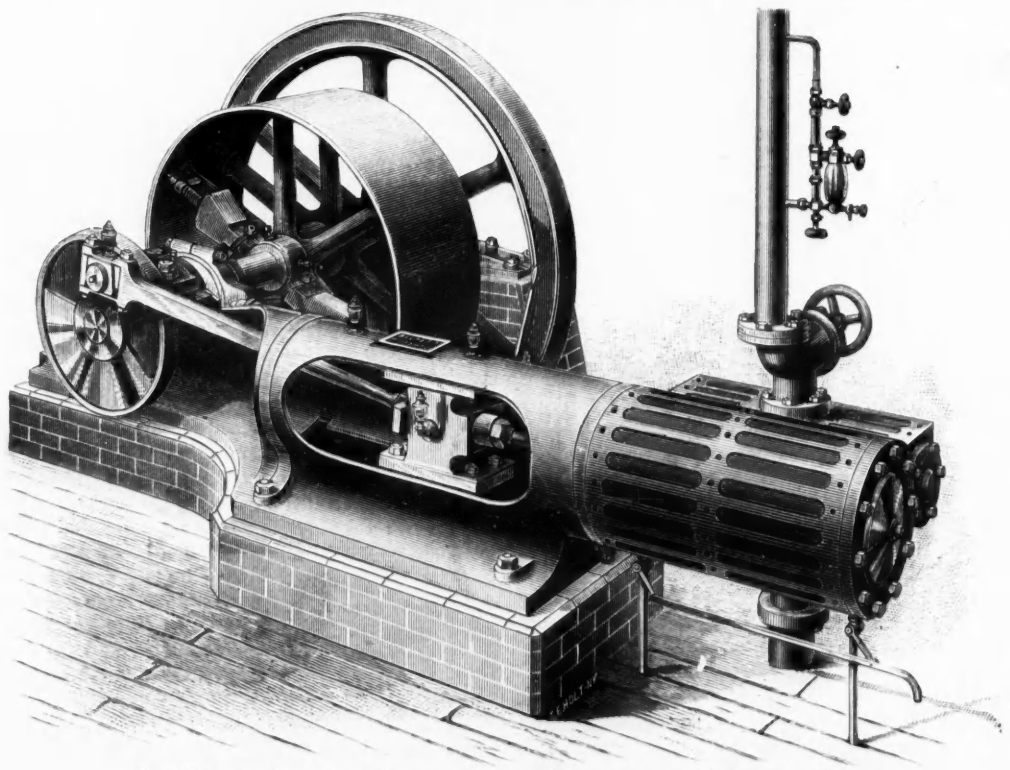
The Baxter Automatic Cut-off Engine.

The engraving of a vertical inverted cylinder automatic cut-off engine represents one recently brought out by William Baxter, 120 Liberty street, New York. As here shown, the engine is of comparatively short stroke (the stroke and bore being equal), which, it is claimed, with the balanced wheel used, the correct counterbalancing and the arrangement of the cut-off mechanism, adapts it to be run at a high rotative speed, by which the greatest economy in the use of steam is attained. We are informed, however, that the practice of the inventor is departed from in this respect, where a prejudice for a longer proportionate stroke and fewer revolutions exists.

The general construction of this engine is so well represented in the engraving as to require no especial reference, the chief distinctive feature being the valve and the arrangement by which it is made automatic in its action. The valve, which is shown in the cut on page 2, is of the "piston" type, but is so constructed as to be adjustable for wear, and at the same time while in use to possess all the characteristics of a solid valve. It consists of two pistons separated by a distance piece, steam being admitted by the inner edges and exhausted by the outer edges and the balancing completed by extending the ports in the cylindrical steam chest entirely around the valve. Each piston consists of the usual spider and follower, between which are held three packing rings. These rings are fitted, one to the other, by a V tongue turned upon the edge of one ring accurately fitting a corresponding groove in another. Each ring is cut once through diagonally, and the three arranged on the piston, so that the cuts shall break joints. Inside these three rings is another ring as wide as the three, and inside this a bronze conical or tapered adjusting ring, considerably less in width than the combined width of the three packing rings. Three screws, equi-distantly spaced, are tapped into this bronze ring, and passing out through the follower, are used for adjusting the packing when desirable. The taper of the conical ring and the pitch of the adjusting screws being known, the exact amount of the adjustment made, in thousandths of an inch, may be readily determined. In making the adjustment, the follower bolts are loosened, leaving the packing rings free to be expanded, and after the adjustment is made they are tightened, which holds the packing rigidly between the piston and the follower. The packing is further held against collapsing by the adjusting ring, making, as will be seen, to all intents, a solid piston without loose parts to catch in the ports, or without spring rings to follow up against soft spots in the seat and wear it out of truth.

The eccentric is connected direct to the valve, and is arranged to be moved by the governor (across the shaft) in such a way as to increase or decrease its travel, and hence vary the point of cut-off while preserving the lead constant. It is held against end-long motion between two collars on the shaft, one of which is the driving disk, since it virtually drives the valve. The eccentric is guided in its motion across the shaft by V projections on one of its faces which fit in V groves on the face of the driving disk, and through which motion is communicated to the valve.





THE BAXTER AUTOMATIC CUT-OFF ENGINE—VERTICAL AND HORIZONTAL TYPES.

The governor is of the disk kind, consisting essentially of two weights arranged to traverse rods extending from the hub to the rim of the wheel, the necessary springs being on the outer ends of the rods and direct in their action. These weights are so connected as to move a traveler let into the shaft like a spline. This traveler is made with diagonal teeth on its outer surface, which engage with corresponding teeth in the inside of the eccentric, and as this traveler is moved by the action of the governor, longitudinally along the shaft and through the eccentric, it moves the latter across the shaft to increase or decrease its eccentricity, according as more or less steam is required.

It will be seen that the parts of the valve-motion are few and direct in their action, simply arranged and easily comprehended, adjusted or repaired should it become necessary. The long ports with long lap and valve-travel admit steam at very near boiler-pressure and bring about a sharp cut-off without wire-drawing. In the larger sizes of engines the cylinders and steam-chests are steam jacketed.

In the horizontal engine shown, the general arrangement of valve, valve-gear, governor and main piston are the same as in the vertical engine. The connecting-rod (as in the vertical engine) is solid ended, the brasses being adjusted by wide flat wedges. The cross-head gibs have broad surfaces, fitting the bored section of the frame, and are in length not less than $\frac{3}{8}$th of the stroke.

The crank shafts are, in the larger sizes, somewhat more than $\frac{1}{4}$ the stroke in diameter, and the journals 2 diameters in length. The pillow-block on the frame is made with side brasses adjusted by wedges, and the outboard pillow block is swivelled to adjust itself in alignment. The piston-rod, valve-stem and crank and cross-head pins are of steel.

S. S. City of Rome's Boilers.

The last time the S. S. City of Rome was in New York she took in 1700 tons of coal, and the bunkers were not nearly empty. When working so that her engines develop 10,000 H. P. that quantity of coal would not keep her going six days. She uses about 2.4 pounds of coal an hour per indicated horse-power. Since the ship made her first trip there have been several changes made in the arrangement of the boilers. They now stand three abreast, and there are 9 double ended and 3 single ended cylindrical boilers, giving a total heating surface of 29,286 square feet, and a grate area 1,533 square feet. The furnaces, 63 in number, are the most approved corrugated pattern. Each boiler has 186 tubes $3\frac{1}{2}''$ outside diameter and $6'7\frac{1}{2}''$ long. Four of the boilers are steel $\frac{13}{16}''$ thick and the others are of iron $1\frac{1}{4}''$ thick. The working pressure carried is 90 pounds to the square inch. Mr. W. B. Cummings, the chief engineer of the boat, was a draughtsman and designer in John Elder & Co's. works, Glasgow, before he accepted his present position. He thinks the engines of the City of Rome are ahead of anything afloat. As is well known they are of the tandem type of compound engines, that style having been adopted for the sake of compactness. As it is, they occupy a large space in the hold, although the vertical space is well utilized. A walk around the engine room and stoke hole and along the shaft tunnel, is like making the tour of a good-sized village.

Northern Pacific Railroad Shops.

By a personal letter from G. W. Cushing, Superintendent of motive power, machinery and rolling stock of the Northern Pacific Railroad, we obtain several interesting facts regarding the works connected with that great railroad. New locomotive shops have been erected at Brainard, Minn., which are completed and in working order. At Fargo, Jamestown, Mandan, Dickinson and Livingston, D. T., new shops are in course of erection, and they will all be finished before winter sets in. In planning the different shops, Mr. Cushing has made special provision for dealing with snow and for preventing severe winter weather from blocking up the works. This feature is too often neglected in the Northwest where shops are generally built as if the designer meant them for Florida. Where heavy snow-storms are common its obstruction to work can be greatly overcome by good facilities for clearing it away, and by arranging the works so that snow will not lodge in large quantities at inconvenient points.

In addition to the shops mentioned, the Northern Pacific Railroad Company are erecting extensive shops at Portland, Oregon, which have been arranged with great care and will hold very extensive plant. Next year they intend erecting large car works and paint shops at St. Paul, Minn.

Some months ago a fatal railroad collision happened at Lockebie, in Scotland, the real cause of the accident being the absence of continuous brakes. The engine-driver of one of the trains was nevertheless incarcerated and tried on a charge of culpable homicide, which terminated in a verdict of not guilty. It seems rather hard lines for engine-drivers over there, when they are made catspaws to save the fingers of general managers.

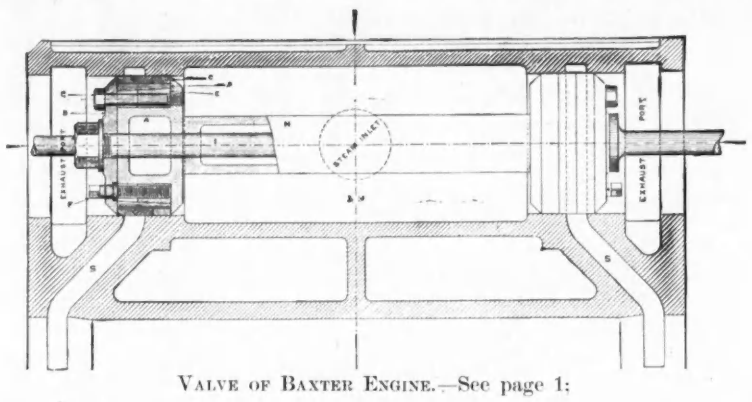
In Georgia, convicts are hired out by the State to aid in the construction of railroads, and to do other unskilled labor. A large number of convicts have been employed on the Mariette and North Georgia Railroad, and a rival corporation lately tried to delay the work by bringing charges against the company of maltreating the convicts. A State investigation was instituted, and the charges declared to be unfounded.

A Traveled Relic.

Just outside of the N. Y., L. E. and W. Railroad station at Paterson, N. J., stands an iron chest 30″ long, 24″ deep and 26″ wide. The chest is used as a tool-box by the workmen repairing tracks, and it might be passed hundreds of times without attracting the least notice. Yet that iron chest has a history, and has been a great traveler in its time. An inspection will prove it to be a strong article, capable of standing hard knocks. It is constructed of $\frac{5}{16}$ iron, firmly riveted in the corners to stout angle iron. That chest, which is capable of holding over ten bushels, was built as a sand-box for a Swinburne locomotive about the year 1850, and it did faithful service in that position for many years.

A Runaway Locomotive.

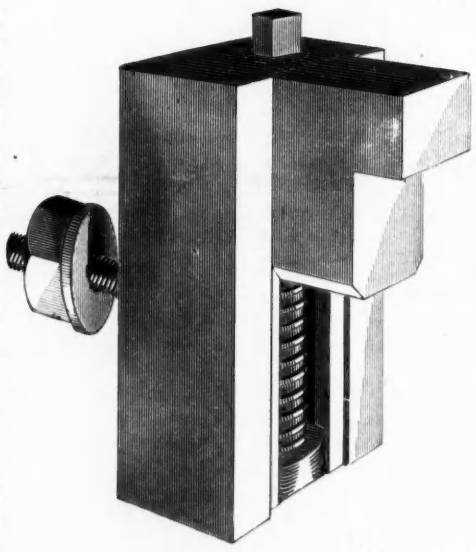
The most dangerous condition about a railroad is a runaway locomotive. When a locomotive happens to start away without any one to control it, the engine does not run sixty miles at a mile a minute, as the blood-and-thunder stories generally make them do; but it seldom gets away without doing serious damage, and sometimes causes a disastrous accident. A late runaway on the Troy and Boston Railroad was caused by a very stupid blunder, and a terrible calamity was averted by the presence of mind of an engineer. A freight train going East was not able to make a meeting point, and the engine was detached from the train and ran ahead to the nearest station to leave orders to stop the West-bound passenger express. In returning to his train, the engineer of the freight engine did not have his engine under sufficient control,

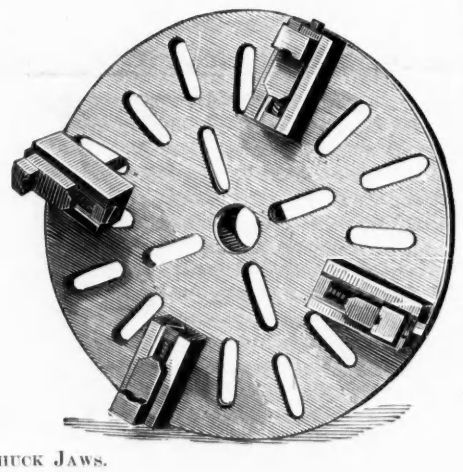


VALVE OF BAXTER ENGINE.—See page 1.

and expecting a smash he reversed and jumped off. The engine struck the freight cars, but did not leave the track, and started off in the opposite direction right towards the passenger train. Before they met, the engineer of the passenger train, perceiving the empty engine coming along at a high speed, inferred something was wrong and got his own train going back before the wild engine struck him, mitigating the shock so that little damage was done.

A new locomotive driver-brake has been invented and assigned to the American Brake Company, St. Louis, which provides for pressing the shoes on both sides of the wheel. With the ordinary run of driver-brakes, the shoes are operated between two of the wheels; and when power is applied, the tendency is to push the wheels apart, which leads to trouble with the side rods and with the driving-box brasses. The new brake is a move in the right direction.



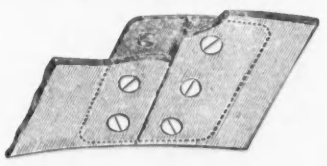


PORTABLE CHUCK JAWS.

Portable Chuck Jaws.

The engravings represent a portable chuck jaw, and the attachment of a set of them to the face-place of a lathe. They can be quickly attached to any face-plate, either of a lathe, boring or drilling machine, the smaller sizes being held by one and the larger by two or more bolts. They can be fixed in any desired position, as for irregular work, and when so fixed will hold heavy work firmly, and are not liable to get clogged with dirt or chips. They can also be advantageously used on the platen of milling or planing machines for holding work.

These jaws are made by the American Twist Drill Company, Meredith, N. H.



New Belt-Fastener.

The belt-fastener shown consists of a curved metallic plate, provided on its concave side with a central rib or fin, against which the ends of the belt to be fastened abut; also with two or more rows of hollow studs, which project through the holes in the ends of the belt, the rib and studs being made in one piece with the plate. The hollow studs are internally threaded and countersunk to receive the screws that fasten the belt to the plate.

These fasteners are made for all sizes of belts — single or double — by Charles J. Humphreys, 34 Oak street, Boston, Mass.

Extracts from Chordal's Letters.

WHITE SHIRTS AND BLUE SHIRTS IN THE SHOP—A GREASY-CLOTHES CLEANER—MIXTURES FOR LUBRICATING TOOLS—LIFTING APPARATUS ON PLANERS—A MEANLY-CONSTRUCTED ENGINE AT AN INDUSTRIAL EXHIBITION—SETTLED DISPOSITION OF NEW YORK MACHINISTS.

Mr. Editor:

* * * Can any one explain the secret of the clean man in the machine shop? In one section of the country the average lathesman, planer hand, or viseman, or floor worker will, in the course of three days, get all the dirt on his clothes that they will hold. These men have a passion for dirty colored shirts, and then they pull outside of them over-clothes made of the most villainous blue. Monday morning they put these things on and look at their worst. This blue, after its third washing and third shrinking, looks worse when it is clean than when it is dirty. About Tuesday this blue stuff comes round to its regular color, and its regular shine. The New Englander wears a white shirt, and he keeps it white. He often wears cuffs, but he does go so far as to take them off and roll his sleeves up about two rolls—say three or four inches above the wrist. When it is time to wash, he washes his hands, and is clean. His work is no harder on shirts than office work. He may wear an apron; if he does it does not get soiled all over, but will now and then show a blotch, or splotch, indicative of some kind of accident. The other kind of a man wears his sleeves rolled up as far as sleeves can be rolled and dirties his arms up as far as the rolled-up sleeves will permit. When he gets dirty, you can see no splotch of black upon this man's duds; they are too dirty to show dirt. I have worked in the shop with the clean men, but could never get on to the trick of their tidy habits. I once thought they did not get dirty because they did not work, but I tried that myself and got dirtier; I was one of the dark-blue kind. I cultivated the apron, and would get so dirty the apron would stick to me. Then I thought the clean man had the advantage of some especially clean kind of work, but I have been at about every kind of work that is done in a shop and it was all the same to me. I finally came to the conclusion that the whole matter was a question of habit, and that a certain class of mechanics, when they first commenced their trade, took up clean lines of habit and they stuck to them. The blue men, on the contrary, covered all over with a something to protect them from dirt, early become reckless, and never outgrow this recklessness. Clean clothes are the best safeguards that I know of against general personal filthiness, and they do not make an energetic man of any less value. A man will stay cleaner in a white shirt than he will in a blue one, and he can do just as much work; and, take it altogether, it will be better work. There is a morality about the execution of work which can be generally detected in it. Slouchiness, if present at all, is ever present. The question of economy in shop clothes is a matter worth considering. Lots of workmen will wear a suit of overalls which cost more, and fit better, than the suit that is under them. The suit that is under them becomes about as badly used up, and as dirty, as though the overalls were not worn. What are the overalls worn for? Or, to look at it in another way, what are the other clothes worn under them for?

* * * One day in a country shop a smart chap walked in and coaxed a greasy-looking chap to take his overalls off for a few minutes. He took possession of them, grabbed a bucket of water, poured in something out of a bottle, chucked the overalls in, swabbed them around in the water a little while, and jerked them out clean, and left the water dirty. Then he made his speech to the hands and proprietor. Said he: "Gentlemen, I have something here worth ten cents a pint, which added to water would instantly clean the greasiest of clothing, or the greasiest of waste. The men can save the wear and tear of their clothes and save their wash-bills, and always have clean overalls, and the water they wash these things in can be sold to the shop to use in the bolt cutter for more money than this patent liquid costs." About this time the proprietor led him out by the arm, and I never got to find out whether there was any virtue in his medicine, either as a cleansing agent or a producer of bolt-cutter lubricant.

* * * Speaking of grease for the bolt cutter, leads me to inquire, in a general way, as to different mixtures of oil and water, and soda and borax, and what not, for use in lubricating tools. In many shops no oil is used on the cutting tools, but instead they make use of some much more clean and efficient and economical mixture. I know of several of these things myself, but think the mention of the subject here will tend to bring out information of a very much more reliable kind than I could furnish myself.

* * * Tool builders are now getting so refined that they put some sort of power-lifting apparatus on planers, and other rail tools of even ordinary weight. This is all very fine if the device was arranged so as to be at all times reliable. The fault with most of them is that they are made to run with an independent belt. Nine times out of ten this thing requires an extra countershaft, and this extra countershaft involves an extra lot of oiling, or an extra lot of neglect. Between the oiling and the rarely-used belt it is often found that the power lift is not ready for business when wanted. If the lifting arrangement is also provided with a hand crank, it will often be found that, for the reasons given above, the lower part of the arrangement is totally discarded. It seems to me that it is about time that some builder of planers fixed up things so that the rail can be raised and lowered by means of the regular planer belt, without any extra trappings, and, above all, without any extra oil holes.

* * * There are lots of exhibitions going on in the country now, and in many of them can be found examples showing the disposition of some to exhibit that which should, if possible, be hidden far from the gaze of man. I was going through one of these institutions the other day when I passed an engine—

probably twenty-horse power—an ordinary looking horizontal concern, except the cylinder end, which consisted of a wooden house, forming a shield over the entire business. The thing looked too bad to arouse my curiosity, but Mr. Harris Tabor, who was along, seemed bound to know what it was all about. So he said to the man in charge, "Some kind of a cut-off?" The man looked perfectly vacant, and Tabor repeated the question, and the man then seemed to understand that, without regard to the word "cut-off," here was somebody who wanted to know what he had on exhibition. He said, "I do not know what you mean by 'cut-off,' but this is a steam engine, and it has not got any eccentric, or eccentric strap, or eccentric rod, or valve stem, or valve gear, or cranks, or anything of that kind." Then he turned a button and opened a door in the side of this wooden house, and he exposed to view the most unholy collection of mechanism it has ever been my fortune, or rather misfortune, to observe. I cannot for the life of me say what was in that house. I can only now remember the character of the workmanship. Mr. Tabor seemed thunderstruck, and asked, "No valve gear, no valve stems, no cranks, what are all these things in here for?" I do not believe now that Mr. Tabor knows anything more about this mechanism than I do, owing to his attention being drawn, after noticing the marvelous complication of the thing, to the terrible botch-work in its making. There were flat eye-bars, which had been forged for eye-bars, but evidently not of the right length, so a wrist-hole would be seen through the body of the bar and nowheres near the eye. A wrist-pin in a crank-arm would be taken hold of by some kind of an eye formed in the end of a thin bar, and the wrist would be a simple bolt working loose—and terribly loose at that—in both the eye and the arm. The consequence was a general getting ready, and taking up of lost motion before there was any final result of an initial movement. As far as the motion itself was concerned, I formed the impression that it was a crank and fly-wheel steam engine, arranged to operate upon the steam pump plan, with some sort of tappet valves, or with all sorts, rather. What puzzled me was the possible motive in putting such a meanly-made piece of machinery on exhibition. The only possible motive in exhibiting the thing must be the introduction of the thing to the public notice, and public notice of such a contrivance, so constructed, cannot possibly be to the advantage of its owners. The building of this wooden house over the cylinder—and it is not a pretty house, either—evinced some common sense, offset to some extent by the fact that the house could be opened so that the interior could be seen.

* * * Some time ago I was talking to an old New York machinist, in regard to the construction, in the West, of a machine which he was then engaged in building. He was a regular New Yorker, and had probably never been outside of the town. I was amused at his idea of this country. He questioned the possibility of his machines being properly constructed away from New York. I hinted, in a mild sort of a way, that all sections of the country had some good workmen, and if they needed more they knew where to go for them, and could go into each particular section and find a class of men which that section might be most noted for. Said this old gentleman, "That may be all right, but when you want really fine workmen, how can you possibly get them? You cannot get the men away from New York; they will not stay." I did not argue with this old man, but left him under the impression that New England, Philadelphia, the Jersey towns, and the entire country, in fact—what there was of it—made little pretension in the way of good workmanship, and could not be expected to, reasonably, considering how few men had left New York to help them.

Very respectfully,

CHORDAL.

We have received a complimentary ticket to a grand ball in Chicago, Thursday evening, October 4th. It is to be given by the Association of Stationary Engineers, Nos. 1 and 2, of Chicago, in honor of the delegates to the National Convention. The occasion will, no doubt, be enjoyable, but pressure of duties at the office desk will not permit us to attend.

The Milling Machine—Its Construction and Uses.

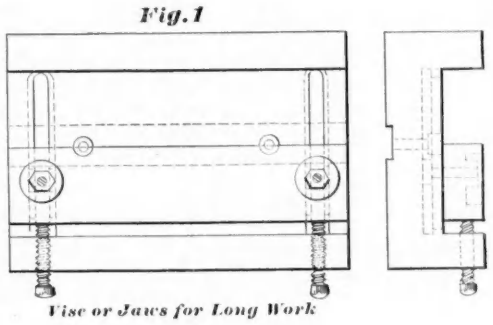
FIFTH PAPER.

BY JOHN J. GRANT.

As the first operation in anything in the mechanical line is to secure the work properly, so in milling it is necessary to have a good bed for the work. In plain slab milling as much care must be exercised in bedding the work correctly as in planing, or the results will be equally as disastrous in one case as in the other.

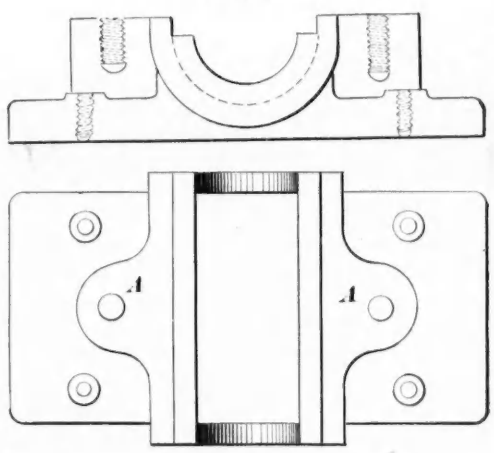
In milling plain flat pieces that are not of a length greater than the vise jaws, the vise will be the handiest place to work them in, only bear in mind that if the jaws are not perfectly true the work will be a reproduction of the fault. In taking the first cut the piece should be put into the vise and screwed tight without rapping down to the bottom, as the first operation is simply to get a surface to start from. In this way a practically true plane wtll be produced. If the piece is square, it should then be turned over with the milled side to the fixed jaw of the vise, and a wire of about $\frac{3}{16}$" diameter put between the movable jaw and the work lengthwise. This allows the work to accommodate itself to the fixed jaw. The piece should not be rapped down in this operation. We now have two surfaces that are (providing fixtures and cutters are correct) at right angles. If there is more than one piece, they should, of course, all be worked on the same sides before readjusting the machine.

Fig. 1



Vise or Jaws for Long Work

Fig. 2



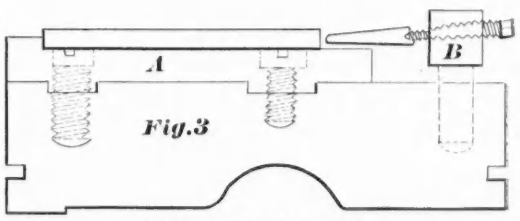


Fig. 3

Platen with Extra Slot

Having now two sides worked, the piece may be rapped down to the bottom of the vise, or the parallel pieces used for raising the work to the proper height. As a general thing, the pieces will be sprung a trifle, and should be straightened or packed under with paper until they bed solidly. In the operation of finish, milling the wire should be used on all sides, and the piece rapped down solid each time. For long parallel pieces a vise made as long as the traverse of the platen is an excellent thing. It can be made cheaply, and will be very handy for splining shafts and such work, as well as for plain milling. A plan and end view of such a vise is shown in Fig. 1. In all plain milling use a cutter as small in diameter as possible. This will prevent chattering. Where the arbor is one inch diameter, the collars or shoulders of the arbor should be one and one-half inches, and the cutter made from steel two inches diameter, finishing about one and fifteen-sixteenths inch and not having over sixteen teeth.

For very accurate work it will be advisable to pass the work twice under the cutter when taking the finishing cut; that is, when the piece has run under the cutter once, run the platen back, throw the feed in and let it run through again without adjusting the machine for deeper cut. This will take out any spring there may be in the machine or arbor, and is especially desirable where the work is irregular in form, as in Fig. 2, as the increased surface at *A* will cause the cutter arbor to spring up when passing this point. In face milling this trouble is not met with to such an extent as in common slab milling.

The speed of the arbor for this size cutter, and for milling common cast iron, should be fifty revolutions per minute, and the feed about thirty per inch to one revolution of the cutter. For wrought iron and soft steel forty to forty-five revolutions, and twenty-five to thirty per inch to one revolution of cutter. These speeds and feed it will, of course, be necessary to vary for different kinds of stock, but the above are safe to us as a guide to the novice in milling.

An assortment of plain straight cutters of two inches diameter, varying from one-half inch in width by half-inches to three inches, and from three inches to six inches by inches, two of each kind, will make a complete outfit for slab milling. If wider surfaces are to be milled, the cutters can be doubled, providing the ends are ground perfectly true on an arbor and the sizes are alike. The finishing cutter should be kept in first-class order, and when worn down can be used for roughing. All these cutters should be cut spiral, and not over one thirty-second of an inch left on the edge of the teeth.

If the platen of the machine is made with one or more T-slots, work can be strapped or keyed down in the same manner that the same work would be done on a planer. If the milling machine is of the plain pattern, with simply a sunken key-way in the middle of the platen, I should advise cutting another about one-half inch wide and of the same depth, leaving about one-half inch margin on each side. In the one nearest the head stock drill and tap holes one-half inch diameter, about six inches apart; this to be used for bolting on a strip or knee-piece, as it is called, Fig. 3, *A*. It is invaluable in milling thin pieces, as they can be held by keys and screw-dogs, put into holes, drilled, about three-quarters of an inch from the outer edge of the platen. These holes should be about three-quarters of an inch diameter, and the same distance apart as the others. As there are a good many who have never seen the screw-dog and key used for this work, a sketch, Fig. 3, *B*, will be of use. The screw should be put through at about ten degrees angle. The manner of holding work is shown in Fig. 3.

C. B. Webster, United States Consul at Sheffield, England, reports that the prosperity of the finer classes of cutlery produced in that district is being seriously impaired by the drinking habits of the workmen. It is a prevailing practice for many of the best artisans to spend Mondays and Tuesdays of every week loitering around beer-houses. The dissipation shatters their nerves so badly that they are incompetent to perform the finer processes of grinding. Razor grinding requires great skill, delicacy of touch, and steady nerves. These qualities do not flourish in connection with hard drinking, so the business suffers.

A Novel Co-operative Enterprise.

We have often called attention to the advantages of co-operation in establishing and conducting manufactures. There are different plans of co-operation that are feasible. The most commonly adopted plan is for every workman in the establishment to be a shareholder, a limit being placed upon the number of shares each individual can hold. This is co-operation in its simplest and most restricted form. Generally the plan is modified after the business is fairly established so as to admit of employing additional workmen who are not shareholders, and occasionally the limit of ownership is withdrawn. In some instances joint stock companies are formed after a few months' or years' operation, a portion of the shareholders buying out the others who have become dissatisfied or whose inclination is to roam about rather than settle down in one place for steady business.

Co-operation on a somewhat novel plan is to be tried in Aurora, Ill. A watch company has been organized to build and operate a factory in that town, and the capital stock is to be wholly owned and controlled by the trade. But one watch-dealer in each town shall own stock, and he shall conduct the sale of the goods in that town, buying direct from the company, thus saving jobbers' profits. Of course, the first step in such an undertaking is to attract the right men to the management—men in whom the trade have unquestioned faith. This, it is said, has been done, and the citizens of Aurora have donated a desirable tract of land upon which to erect the shops. Further than this, a working force of competent skilled mechanics of experience has been secured, who are now at work constructing special machinery to manufacture the watches. The enterprise ought to prove a success, and it may be the pioneer of many more, organized upon the same plan, to enter the industrial arena in years to come.

Premiums for Economy in Locomotive Running.

Several of the most important railroads in the Eastern States have introduced a premium system in running their locomotives, whereby the enginemen receive payment for the coal and oil saved. This system of paying by results has been successfully tried at various times, and has always been the means of reducing operating expenses. Many years ago Thomas Wynans took a contract to operate a railroad in Russia, where an extremely wasteful system prevailed. Seeing that he was likely to lose money by his contract, Mr. Wynans conceived the idea of paying the enginemen a percentage on supplies saved. The plan worked so well all round that the contractor made a respectable fortune, and the men never before or since made such high wages.

A similar system was tried on the Philadelphia and Baltimore Railroad, which for a few years about 1850 was operated by contractors. In this case great saving resulted from the payment of premium to the enginemen, but when the contract system was abandoned the plan of paying for saving was also given up. The premium system sometimes works injustice to individual engineers who may have bad engines, but it has an excellent effect on the general run of enginemen by making them study closely what methods of firing and steam-using are most conducive to coal-saving.

A textile manufacturing firm, Boston, have adopted an electrical work indicator which records the movements of all the looms and other machines within the works. The indicator occupies little more space in the office than a common clock would fill, yet a glance at it will tell how all the operations throughout the large works are progressing. This method of work recording by electricity might be usefully extended into many other mechanical departments. The capability of electricity for purposes of this kind is not properly recognized.

Top Pouring Gates and Sweeping a Lathe Face Plate.

By Thos. D. West.

A thorough knowledge of the practical working, so far as results are concerned, of the different styles of gates commonly used will always be a valuable acquisition to the knowledge required to insure clean castings. In previous articles I have shown the action and adaptation of various forms of gates. In this article I will try to present a few ideas concerning what are called top pouring gates. As a general thing, the merits of this gate are lost sight of through its use being more a matter of necessity than as a valuable auxiliary in pouring moulds. Many moulders use it simply for its convenience, and not from any knowledge or intention of its usefulness in making a clean casting.

As a general thing, top pouring gates act as a positive skimmer, for the reason that there is nothing to prevent the flow of dirt to the top, and the iron that passes into the mould being free from impurities; that is, if the gate is properly made. What I mean by positive is that the principal is positive, and if the action is not so the fault lies with the one who makes the gate. I have seen some very grave errors committed by men who should have known better; that is, if thirty to forty years' experience are worth anything.

To show up some of the errors made in the construction of basins and top pouring gates, the engravings illustrate a "Right" and a "Wrong" form. The basin marked "Right" represents the clean iron dropping into the mould, as seen at *F*. Upon the top of the basin iron is shown the dirt. This condition will exist if everything is made as it should be. But it is astonishing to note how small a matter will destroy the positive action of the gate.

I will first try to show some of the errors made every day in this respect, and in almost every machinery foundry. The first one is in the bottom of basin, which, instead of having an incline from the pouring end down to the grate, as seen from *P* to *T*, is made to incline exactly the reverse, as from *R* to *Y* in basin, marked "Wrong." This causes the iron to run up-hill, which for long basins is detrimental to keeping the gates full.

Another error is in making basins too small, which makes it impossible to keep the gates and basin full, which must be done in order to keep the dirt from passing into the mould. Were a basin the dimensions of the one marked "Wrong" used in the place of the one marked "Right," in pouring such a casting as is shown, the result would be that the gates, *H*, *B* and *S*, could not be kept full, and the dirt that should be kept upon the top of the basin iron would all pass into the mould.

Still another error in making long basins is not having the runner or basin-box level. I have often seen bad results from this blunder. I remember a case where the moulder, when pouring his mould, could get but little iron to run down the gates. The cause of this was having the bottom of the runner inclined, as seen at *Y* and *R*, and also the basin end *M*, down very nearly level with the gates. Such an error as this could easily occur if the moulder was careless, or did not *think*.

The last error that I will at present notice is one very commonly committed in making small as well as large basins or runners. Upon the right are seen four cuts showing the side and plan views of short basins. In the upper cut the basin is shown made larger around the gate than in the lower one. In pouring moulds with top gates, the action of the iron, upon running into the mould, sucks down any impurities that may be directly over or near to the gates. The more room around gates in a basin the better are the chances for all the dirt to remain upon the top of the iron. In the large basins at *S* and *H* this point is also shown. In the cut marked "Right," the runner or basin is seen to extend beyond the gates. Iron poured into basins flows towards the gates and beyond them, if there is room allowed for its doing so. The flow carries with it the dirt, so that if a basin or runner is made to extend beyond the gates, the dirt (or impurities) is also carried beyond the gates, thereby assisting to prevent the dirt from passing into the mould. I don't care what shop that uses top gates may be visited, one will be very apt to see some of the above errors daily committed. To make top gates positive purifiers, or skinners, is an easy matter, if a little common sense is used. To notice the way that the majority of basins or runners are constructed, would lead one to think that common sense was a very scarce article.

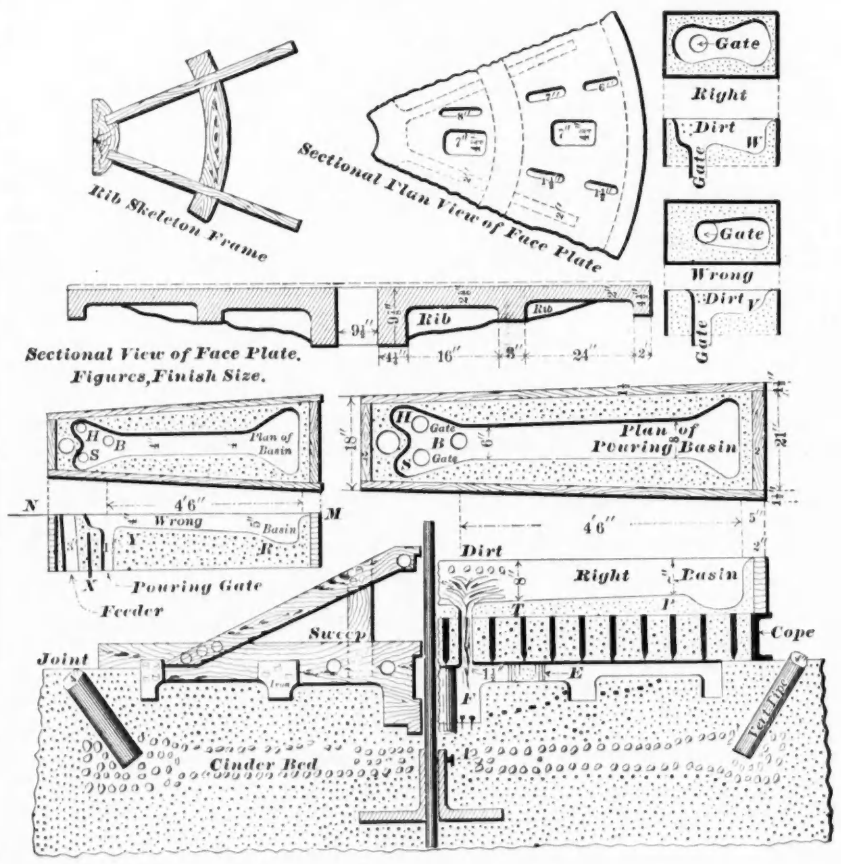
To show the results of proper top pouring, the sweeping and pouring of a nine-foot lathe face-plate is illustrated. The sectional view of face-plate is that of a casting made and used in the Cuyahoga Works. The dotted line over the face represents $\frac{1}{4}''$ thickness that was turned off in finishing. The casting was made by the use of the sweep and rib skeleton frame shown, and to the moulder who made the job much credit is due, for any one in looking at the casting would hardly imagine that it was cast face up, it was so clean.

In sweeping this mould, the spindle seat being set, a good cinder bed was put in. A plain sweep (not shown) was then attached to the spindle arms (which also are not shown), and a plain hard bed was swept up. The sweep being then removed, the bed was sleeked and sprinkled with parting sand and the cope rammed up. The cope being hoisted off, the sweep, as shown, was then attached and the bottom swept out.

It might be well to state that before the plain or cope sweep was attached the bottom sweep was attached, and a rough form of the mould's bottom made about two inches lower than the intended bottom surface. This space was then filled with facing sand up to the level of the joint, so that in sweeping out the mould, after the cope was hoisted off, the bottom would be all formed in facing sand.

After the sweeping was finished, the rib skeleton frame was bedded in and eight arms formed. The sectional view of face-plate shows the number and sizes of cores set between each of the arms. The cores were made just the thickness of the mould, and were set upon the surface without the use of prints, as seen at *E* in the section. It was, of course, seen that they all touched the cope in a firm manner, in order to prevent them moving when the mould was poured.

By this plan far larger face-plates than the one shown could be made without a pattern, and not only castings of this form, but many other classes of castings, can be made to have their cope face clean by an intelligent use of top pouring gates.



Top Pouring Gates and Sweeping a Face Plate.

We have societies for the promotion, prevention, encouragement or suppression of almost every imaginable thing, but still we have not quite enough, says a Philadelphia writer. We need one more—a society for the suppression of spontaneous combustion. Buildings are getting to be too big and their contents too valuable to be left at the mercy of any stray pile of greasy rags or oil-soaked newspapers. The human life that is so frequently lost in these conflagrations does not count for much, of course, the victims are so easily replaced, but even this is becoming worthy of consideration, since the surviving relatives have fallen into an awkward habit of suing for damages. People who put up expensive buildings and fill them with valuable goods or machinery should be taught the few plain principles of practical science which control spontaneous combustion.—*Fireman's Herald.*

The new S. S. Oregon recently launched for the Guion line is reported to have made twenty knots an hour on a trial trip.

Personal Recollections.

By S. W. Goodyear.

I promised some time ago to put in writing for your paper some personal recollections of different ways of "doing things" in shops where it was desirable to make the entire production of each special class and size of machine alike. To accomplish this, there were many pieces to be made, each of itself requiring great skill and care in its production. How best to provide means whereby less skillful hands could turn out better work and at the same time more of it, and the careless hand be forced to become practically careful—because, forsooth, the tools and fixtures he had to use could only be used in one way—were important questions. I had a call back in the fifties to take charge of the manufacture of sewing machines, which I accepted, and while I can promise your readers no recital of wonderful mechanical triumphs, as viewed by the light of later experience, it may prove interesting to review some of the methods employed at a time when there were practically no means in most shops—outside of the national armories and a few private establishments engaged in the manufacture of fire-arms—for duplicating work.

In the establishment of which I was called to take the superintendence, sewing machines had been *built* for some time. The proprietors wished to commence *manufacturing*. Holes had been located by laying out. No two machines had been alike. Not even were any two essential pieces alike, and each machine—in order to work—required to have its own parts as originally fitted. To particularize: The holes for the screws by which the upright part supporting the needle-arm and presser-foot, &c., &c., was attached to the bed-pieces, had been laid out by the use of sheet-iron templates, through which prick-punch marks could be made by which to do the drilling. Other holes had been laid out in a similar manner, or by the more primitive method of straddling with dividers. The crank which gave the needle-bar its vertical reciprocal motion had been chucked and bored by grasping the hub, and afterwards turned up on an arbor with all the precision which would have attended the turning of a piece weighing hundreds of pounds instead of less than three ounces, as in the case before us. The plain side must be faced up, the hub was to be turned as nearly to a fixed size as possible, and from the hub out must be faced down to a given thickness, while the hub must project a certain distance from this face. To do all this properly took a good man, and with calipers, and niched gauges, and many changes from diamond point to cutting down tool, and from these to side tool, "cutting and trying" by caliper and gauge for each size, or thickness, or length required, never making a fixed position of tool determine in advance the result of an operation, this skilled machinist who had served a regular apprenticeship, and was proud of the fact, and of the good work which it enabled him to do, could by strict attention to business chuck and bore, and turn up cranks the extreme variations in measurements of which in essential parts would not probably have exceeded $\frac{1}{32}''$. Many of them had the impress of a constitutional tendency on the part of the lathe on which they were turned to not square up accurately, thereby causing the crank pin when set to "stand in" or "stand out," as the case might be.

A few weeks sufficed to place this "crank job" in the hands of a young man not yet out of his time as an apprentice, who, by fastening the crank on an angle plate, gauging it to proper position by the hub, the dead spindle of the lathe movable by a lever, was making a little hand-lathe drill and ream the hub end of more cranks in an hour than my first-class man would chuck and bore in half a day. Next came the facing up and turning the hub to size, which was done with a plain facing cutter with a stem like a counterbore on the plain side and at the end of the hub, while a combined facing tool and hollow mill faced the other side and sized the hub at the same time. By this method we had the hubs of a practically uniform size, as the hollow milling tool, which was made by setting cutting blades in radial grooves in the face of a disk attached to a shank, could only cut to the size for which the blades were set except as affected by wear, and when dull it was an easy matter to remove the blades, sharpen and replace them to again cut the same size. Added to this was a jig, comprised of a drilling-plate and stud and key, by which the hole for the crank-pin could be drilled an exact distance from, and parallel with, the main hole. This gave means for producing cranks such as were not to be had at the hands of our best men before, and they could be made by boys, while the number produced in a given time was increased more than fourfold.

Does the opponent of labor-saving devices ask what became of the skilled machinist who turned the cranks before these improvements were made? He was promoted to the position of tool-maker, and other first-class men were hired to join the ranks with him, for of all things most needed in this shop were tools, jigs, and fixtures.

An index milling machine and plain "slabbers" of the "Lincoln" pattern, built under the superintendence of F. A. Pratt—later of the Pratt & Whitney Co.—than which none better could be had in those days, found their way into the shop. Gangs of cutters were

made to produce at a single cut irregular surfaces which had before been made by a tedious process of planing as nearly as possible to scribed lines, and finishing imperfectly with files.

The needle plate had been fitted to a so-called "dove-tailed" seat in the bed by bevelling its edges to fit the seat which had been planed on a little hand-planer. This planing of an under-cut seat was a slow, unsatisfactory, profanity-provoking job, in which many tools were broken, and no two were planed alike. To fit the plates to the seat so as to make a decent joint at the edges, and at the end where the casting had to be filed out, called for good work, and was at the best a slow job. I decided to mill the seat, changing the end of the plate to a semi-circular shape to fit the milling when beveled. This proved a great success, as a greater number of hundreds of plates could be put in their places in a given time in this way, than of dozens in the old way, and by care taken to not run a milling cutter too long the seats were alike. The plates were milled at the edge to fit the seat by starting a cutter of suitable bevel at a front corner of the plate, carrying it along to a point corresponding in distance from the semi-circular end with the half diameter of the cutter used in milling the seat in the bed-piece; then holding the cutter stationary, giving the plate a half revolution by turning the seat on which it rested on a pivot, after which half revolution of the plate the cutter passed on, completing the beveling of the other edge. This left the edges parallel with each other, and the semicircular end exactly concentric with the edges, thereby insuring a good joint all the way around when pushed into the seat in the bed-piece.

The above description is accurate, except, that in many cases, milling cutters are made to travel over the work. I have suited the description to that plan; whereas, as a matter of fact, in the case under consideration, the cutter was run in a fixed position in a small hand lathe, on which had been fitted a bed-piece and slide bearing the swiveling rest on which the plates were fastened for milling. The plate was fed forward until a removable stop was reached, then the swiveling rest being turned half way around the stop was removed, and the plate carried forward again until the second edge was beveled. I have described this process thus minutely because I found it, for the purpose, an admirable plan. It did not occur to me that it was patentable, but I was told many years later that a patent was granted on a grinding process involving the same principle. The same thing was shown to me a few years ago as applied to a nice operation of fitting a plate to a milled under-cut seat on some gun work. Aside from this I have never seen it used since my use of it as described. There are many places in which it would be very valuable.

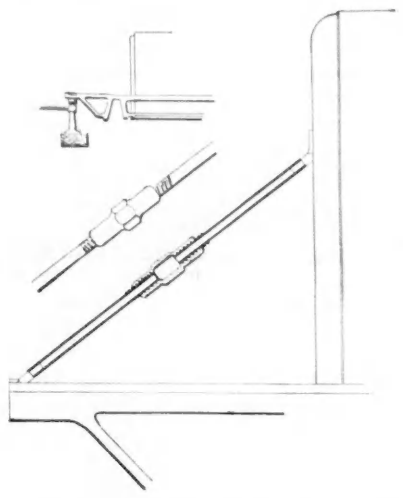
As in the way by which the standard and bed had been drilled and fitted to each other, there was no certainty of the needle bar ranging to any particular point in the needle plate, and each plate required to be marked to its respective place, for it would fit in no other, the plan for locating the needle hole in the plate was to use a prick punch, the body of which fitted the needle-bar bearing in the standard. Having its point concentric with the body this must mark the plate for drilling exactly where the needle would range in the needle bar. With this hole drilled in the plate, an initial point was had from which to lay out the feed slots, and throat, which were drilled and filed out. Slow! does the modern machinist say? Well, yes, but it is not long since I read a long editorial in a journal devoted to mechanical and manufacturing interests bemoaning the sad condition produced by the introduction of modern labor-saving methods because it had done away with, and made unnecessary, that high degree of skill which was so common and indispensable in those good old days.

Having thus provided means for making the plates and the seats in which they were to be used practically alike, my next move was to make a die and punch, by the use of which, in a press, the needle hole and feed slots in the plate could be punched at a single stroke, and by gauging the plate to position over the die by pushing it into an under-cut seat, which was a fac-simile of the seat in the bed-piece and was attached to the face of the die, the positions of the hole and slots in all the plates were alike. This furnished a starting point. Next a steel plate was made fitting the seats in the bed-pieces and having through it a hole of the exact size of the needle bar, and in the exact position occupied by the needle holes in the plates proper. The next thing in order was to provide means for drilling the holes through the bed-piece, and in the foot of the stand for the screws with which they were to be fastened together, so that the needle bar should range exactly with the needle hole in the plate. A jig was made for drilling each, in which a projecting stud entered the above described hole in the steel plate for locating the jig on the bed-piece, while the jig was located on the base of the stand by a stud which entered the hole for the needle bar, which had been drilled and reamed previously, to insure the wished-for result, it was of course necessary that the relative position and distances of the holes through which the drilling was to be done should be precisely the same in the two jigs, as measured from the initial point, *i. e.*, the hole to which the stud was fitted, as well as that they should, in shop parlance, "be drilled to match." This was accomplished by clamping the two jig frames together and drilling and reaming the respective holes in each at one and the same time. The jig frames being of iron, the holes were made larger than the holes which were to be located by them, and bushings of steel, hardened, were used through which to drill. In this way the distortion, caused by hardening, in making jigs is reduced to a minimum, the essential points in the frame of the jig are not changed by the wear of use, and whenever the bushings become worn they can be replaced by new ones at small expense, thereby keeping the jig for an indefinite length of time up to the full degree of perfection which it possessed when new.

With these jigs completed we were able to fasten together stand and bed-piece without selection, and pushing into the milled seat in the bed the first plate at hand, or any number of plates in succession, the needle hole in the plate and the needle bar in position in the stand would be found concentric with each other.

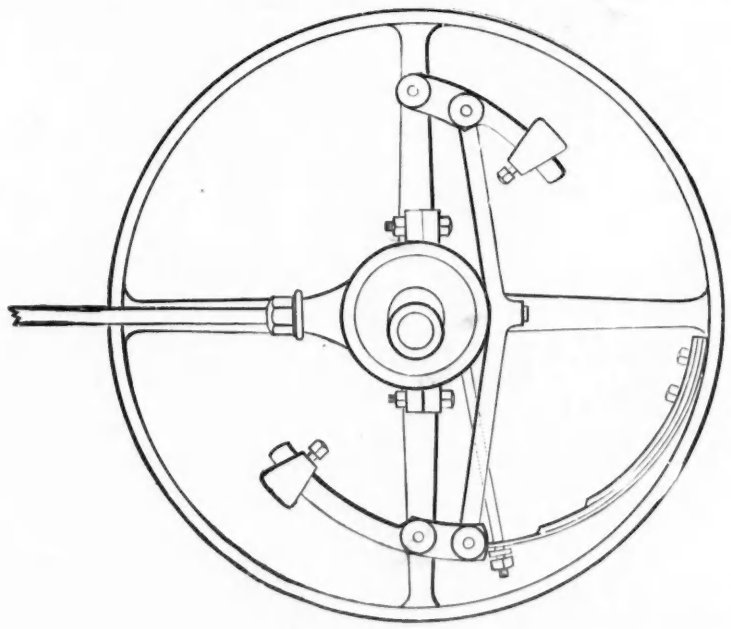
Does some reader whose shop life has brought him in daily contact with all the modern appliances by which almost miraculous results are produced feel like asking: Why listen to the recital of an experience so simple? Let me reply that with these simple improvements, the actual cost of performing some of the operations had been reduced 90 per cent., while the fact that once done the work was right, carried the saving through all subsequent operations up to the time the machines were packed for market.

But improvement in facilities did not stop here. The success thus far had only whetted the appetite for more, and so one after another each piece in the machine, every hole to be drilled and all operations susceptible to such treatment were brought under some rigid method by which the means employed determined in advance the character of the work when done.



Movable Back Boiler-Brace for Locomotives.

Back boiler-braces have been made a fixture on locomotives without there being any great need for their presence. The only real need for a brace in that place is to prevent the frame from being bent when the engine has to be jacked up, while the back pedestal binders are down. But binders are rarely down, and the back braces occupy space that can badly be spared about the boiler head, where the demand for room to put brake attachments, injector connections, and other fixtures is difficult to supply. The common back boiler-brace is a source of continual inconvenience to those who have to place attachments upon a boiler head. To end this trouble, a movable back boiler-brace has been invented which is illustrated on this page. Cleats of angle iron are attached to any convenient part of the boiler head as rests for the top of this brace. When it is necessary to jack up the engine, the braces can be attached in a few minutes, a right and left screw in the middle of the brace giving a convenient means of tightening it up. This brace is the invention of John J. Reid, general foreman of the Rogers Locomotive Works, Paterson, N. J.



Grist's Governor.

Grist's Governor.

This invention, which we illustrate herewith, is one of the class of governors that work on the main shaft and control admission by increasing or diminishing the stroke of the valve stem. The Grist automatic engine governor possesses, in a striking degree, the merit of simplicity of details. Owing to its consisting of few parts, this governor can be made cheaply and applied without loss of time. The eccentric, which is directly controlled by the governor, is attached to the valve stem, and any change of speed is felt at once and cuts off instantaneously. When the weights are thrown out by centrifugal force, the eccentric is thrown in next the center and the travel of the valve equals the lap only, and no steam is admitted. The action of the weights is opposed by the spring, which is adjustable to the required speed. Should a belt fly off, the weights extend at once, cutting off the steam so that the engine will stop without doing damage. The inventor, Thomas A. Grist, of Cedar Rapids, Iowa, is a working machinist and has devoted much time and labor to perfecting the details.

He invented a tail weight to put on his cow. The first made—a small iron ball—wasn't heavy enough to hold her tail down, but it broke his jaw. He lives in Camden, N. J.—*Columbia Courant.*

LETTERS FROM PRACTICAL MEN.

The Injector.

Editor American Machinist:

Having noticed Mr. John Richards' criticism of Mr. Sinclair's explanation of the injector, I was in hopes Mr. S. would come forward with a supplementary explanation; but as he has not done so, and it will certainly be of interest to your readers to have a correct explanation, I have ventured to say a few words about it.

If I comprehend correctly, the principle of the injector depends on the fact that steam has a much higher velocity than water, when both are each forced through equal-sized apertures by the same amount of pressure. The velocity of steam escaping through a hole of 1″ area, at a pressure of 15 pounds per square inch above the atmosphere, is 1,440 feet per second. Water forced through a hole the same area at the same pressure would have only a velocity of 45 feet per second. If, then, a stream of greater velocity be directed against the issuing stream of water, it will enter the vessel notwithstanding the pressure therein.

The steam jet in the injector is condensed, of course, when it strikes the water, but it maintains its velocity, and is thus enabled to force the water against a pressure even greater than the steam pressure in the boiler. It is true, as Mr. R. says, that "steam and water are the only elements where such action would be possible," unless some other vapor could be used that would condense as readily. If I am wrong in regard to the injector, I hope some of the high and mighty among mechanics will correct me, for the benefit of myself and your other readers.

I wish to call the attention of Chordal to the fact that in the American Machinist, of December 27th, 1879, he promised to explain at some future date the principle of action of the planimeter. I hope he will be generous enough to respond, and keep his promise to your readers. A. Randolph.

Simplicity vs. Complexity.

Editor American Machinist:

It is a common saying that the more simple a machine can be made the better, but experience teaches that this is not always the case. It often happens in the process of perfecting a machine that the addition of an extra piece or two and an extra motion contributes greatly to its efficiency. When I first saw a Wheeler & Wilson sewing machine, with its simple, beautifully-finished revolving hook stitching at such a rapid rate and so quietly, I said to myself, here is certainly the "perfection of simplicity" in the sewing machine line. The other day I happened in a Wheeler & Wilson salesroom, and was greatly surprised to see the change which had been wrought in this machine since I first saw it. Instead of a uniform rotary motion, it has now an intermittent action, which is ingeniously brought about by placing the axis of the hook a trifle one side of the axis of its driver, and interposing a link connection. A "take up" device has also been engrafted upon the machine. These other minor changes have, of

course, added greatly to its complication; they have also added greatly to its efficiency. The original machine required great delicacy of adjustment every time the thickness or quality of work was changed, which greatly impaired its utility. The "intermittent action" and "take up" seem to be as essential to the perfection of the sewing machine as sun and rain is to vegetation. While I was present, the operator stitched a package of material consisting of three thicknesses of felt alternating with three thicknesses of common tin plate. This was done at the usual speed, without breaking or fraying, the thread passing directly from this package to a single thickness of felt without change of speed or tension. A pretty fair illustration, surely, of the value of a little complication in this case.

The steam engine affords a more notable instance, perhaps, of the value of a little complication. The application of four valves instead of a single one for controlling the action of the steam upon the piston, and the automatic closing of inlet valves by governor, are features which seem to be indispensable to the highest economy of the engine, notwithstanding the great complication they involve. The time is coming when some lucky inventor will hit upon some device which shall supersede the present wasteful link arrangement, and do for the locomotive in the way of economy what the independent exhaust and automatic expansion valves have done for the stationary engine. There is one feature in all machine construction which can never be complicated without violating sound philosophy and good sense. I refer to the style of finish. I think, however, that machinists are slowly improving in this direction, and that some time in the near future they will show us now and then a machine that is not debased by some senseless quirk or bead which is of no earthly use but to catch dirt and oil. F. G. WOODWARD.

Criminal Ignorance in Boiler Setting.

Editor American Machinist:

In a mill situated in the Blackstone valley, the owners found themselves short of boiler power, and concluded to put in another boiler beside the two they already had. They gave the charge of setting the new boiler to a Mr. Somebody, who, as the owner said when he introduced him to the superintendent, knew "everything about heat and steam." The boiler was four feet diameter, fifty 2½" tubes, sixteen feet long.

The first thing he did was to set up the front, and bolt it to the boiler with a wrought iron knee. Then the bridge walls were built up until within three inches of the boiler. On top of the bridge walls he placed plates of iron one inch thick, and upon these plates he also placed a two-inch iron roll about a foot long, as shown at *b*, Figs. 1 and 2, as he explained for the boiler to roll back on when it expanded.

Here the engineer put in a word, asking if it would not be poor policy for the boiler to expand all one way, on account of breaking the joints of the steam pipe at *A*. As the pipe ran towards the back of the boiler, it would expand forward and the boiler backwards. But he and his theories were quickly sent to the dogs.

The side walls were next erected, and were not allowed to touch the sides of the boiler within six inches, allowing the brackets (which most horizontal boilers rest upon) only just touching so as to steady the boiler, as shown at *x*, Fig. 2. The walls were built double, with a four-inch air space between, as at *H*, Fig. 2. The forward bridge wall being hollow, opened into this space at *d*, Fig. 1, the front side being perforated to admit air over the fire.

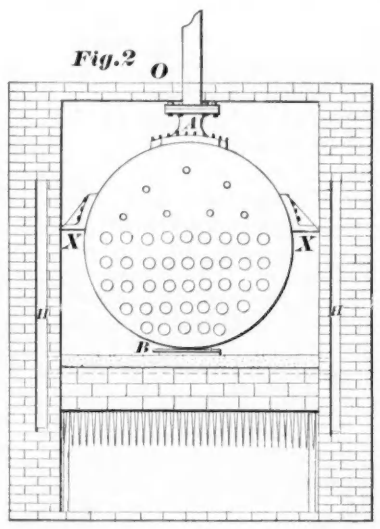
The back end wall was then built, sixteen inches thick and sixteen inches from the boiler, a heavy plate of iron being placed across just above the tubes as at *e*, Fig. 1. After this the top was covered over and made tight by pouring on thinly-mixed cement. This cover came above the nozzle at *o*, which was exposed to the most trying heat.

The man-hole was provided with a sheet-iron drum, *g*, which was filled up level with sand. Then to the piping the compound box was set so that the middle cock came level with the bottom of the first line of tubes from the top, as shown by dotted line at *y*. It was claimed that the water would boil enough to keep the top line of tubes covered.

The engineer was put under strict orders not to run the water above the middle gauge-cock only when leaving the boiler at night, and it may here be stated that the result was that in less than a week after the boiler was started the tubes had sprung up 1¼ inches in the center.

The grates were then put in place, coming within fourteen inches of the crown sheet. All being completed, the engineer was ordered to build a fire under this infernal machine

Fig. 2



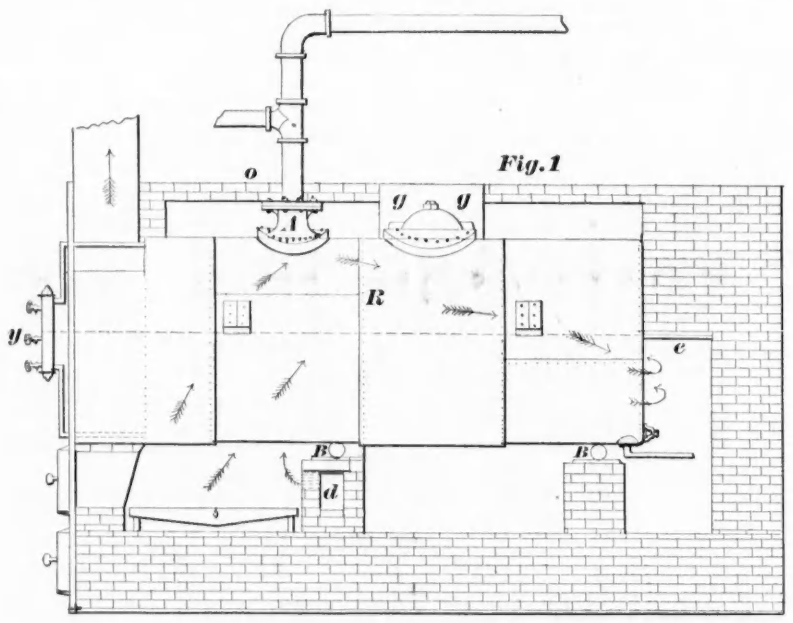


Fig. 1

and run it twenty-four hours without raising steam, which was done, and the next morning connections were made with the other boilers. At 6.30 A. M. it was steamed up and started on its eventful career. At 7.30 A. M. the man-hole began to leak and shower the sand about. The engineer went up with a trowel to scoop the sand out, and found to his astonishment that the sand was red hot. He scooped out the sand, tightened up the nuts, and stopped the leak. At 8 A. M. the packing blew out of the nozzle *A*, under the brick top.

The fires were hauled, and the boiler laid up for that day. At night the brick-work was taken up and the joint unpacked, and some of the rubber that was in the old joint preserved for future reference. It was burned to a cinder. The joint was put up and the boiler started again. In the morning when the owner came around the burned packing was shown him by the engineer, and the request made that he be allowed to drop the brick work away from the nozzle, letting it be exposed to the air. He was promptly told to run the boiler as it was set. Hardly had he finished speaking when the packing blew out again, and it blew out four times for four consecutive days before 9 A. M., three different kinds of packing being used. The owner then told the engineer to fix it to suit himself, and he had no further trouble from that source.

The boiler did quite nicely for five weeks, when the engineer's attention was attracted by a low hissing sound. He went on top of the boiler and cut a hole through the bricks and found that the noise came from a seam in the boiler, which was leaking badly.

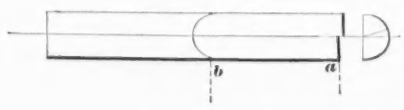
He cooled things down as soon as possible, took off the man-plate, and went in to see what was the trouble. It did not take him long to find out, for the side seam above the water line had ripped open fourteen inches from rivet to rivet.

Meanwhile this wonderful boiler setter had been taken sick, and the owner waited three months for him to get well. When he did get well he tore down the side walls to the water line and went away, and the engineer says he has never seen him since. The owner then sent boiler makers, who put on a half sheet at a cost of upwards of $200, and when the brick-work was put up he put in long slabs of soapstone that projected over against the boiler at the water line. These slabs were only 1¾ inches thick. Then the boiler was again fired up, and run about four months, when the engineer took another job; but before going he took out the grates, got the superintendent into the fire-box and showed him where the soapstone slabs were nearly burned away, telling him that he must have it repaired within three months or he would burn his boiler. In less than a month this superintendent died; and about four months after, the other side of the boiler ripped open.

About a week after it happened the old engineer met one of the owners, who accused him of burning the boiler. The engineer offered to prove by any competent authority that a boiler set as this one was could not stand. I think the setting-up of a boiler in this way to endanger the lives of people should be punishable by law.

The boiler was reset in the ordinary way, and has not been heard from since.

PACKING.



Drilling Long Holes Straight.

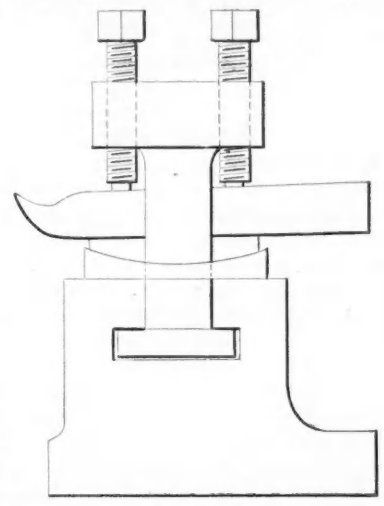
Editor American Machinist:

If J. C., who inquires about drilling a long hole in a shaft, will made a drill as shown in the sketch, he will have no trouble. It is an old tool, but a very effective one for the purpose. It should be made of steel the full length, turned to the size wanted, and the end faced; then plane one half away, leaving it half-round, and cut a quarter of the circle down $\frac{1}{16}''$, as represented, for the lip. It may, for his purpose, be made half-round for a distance *a*—*b*, of 10", but if made so for nearly the entire length the chips and oil will clear better. With the shaft in chuck and center rest, and running perfectly true, by starting the hole with another drill and then using this one he will be able to split the center on the other end of the shaft every time. DRILL.

A Proposed Tool-Post.

Editor American Machinist:

While running a lathe, a few days since, with the concave washer and tilting piece, it



occurred to me that a very effective tool-post of this kind could be made by using two tightening screws instead of one. The single screw is likely to slip, especially when boring a long hole with a heavy cut. With the two screws the tool would be held firmly. One screw could be used for tightening and loosening the tool, and the other for adjusting the cutting edge higher or lower. The sketch shows the idea.

P. C. FORRESTER.

Work of an Ancient Machinist.

Editor American Machinist:

I have been reading over Chordal's Letters, and some of his characters remind me of a mechanical oddity who worked in a shop I was brought up in. The man was an oddity—not for the refinement of his skill or for its peculiar methods of demonstration, but for his unshaken egotism that never failed to assert itself, while the man never rose above being the very poorest kind of workman. Although old in the trade, he could do nothing higher than cut bolts to a length, face nuts and such work. When Clark got full, which was pretty often, he would stand up on a casting a perfect Pickwick in appearance and say, "Gentlemen, these are the two hands that have the touch to do the finest kind of work, but my big head spoils the job." Although he had worked for twenty years on a lathe, he knew nothing about the modern slide rest. One day he was set to work to bore out a cone pulley. He stuck a flat drill in his tool-post and ratchet-feed and went to sleep. When he awoke the screw of the lathe spindle was cut out. He backed out his tool and the entire outfit fell to the floor. His wonderful mechanical achievements, like extraordinary feats of some other people, were always done in the past. He had a story of an unparalleled performance in cylinder boring. It was a 72-inch cylinder, and he bored it with a heel tool. He bolted it to the face-plate, ran a long bar of iron in through the cylinder for a rest, made it fast on the outside, then put a plank in making it also fast on the outside. He then crawled inside on the plank and sat down upon it, resting his heel tool on the bar, and bored out the cylinder as true and clean as they can do it now with the modern boring bar. A. M. D.

Reasons for Leaving a Situation.

Editor American Machinist:

In issue of September 29th, F. J. Masten does not compliment me much for throwing up my situation as foreman because of a difference with the proprietor. I am aware that the man who leaves one place without having first provided another, is likely to suffer more loss and inconvenience than he inflicts upon the employer; but when a workman loses confidence in the good intentions of his employer, it is better to leave just as soon as circumstances will permit.

The wise employer does not keep a man when he has lost confidence in his good intentions. The workman may make mistakes and have serious faults, but many shortcomings will be overlooked if his intentions are good.

This mutual confidence in the good intentions of each other, is the first great requisite between employer and employed; and when this confidence is lacking, they cannot separ-

ate too soon. It were better had they never met.

As for demanding our rights, I have observed that in this world men get of good things only what they can command.

It may be well enough (but I do not believe it is) in story-books for good little boys to picture greatness as always on the alert to discover modest merit and bring it to the front rank, but the fact is that greatness is apt to be very busy in looking after its own interests, and an humble mechanic must push himself, or no one will push him.

A skillful mechanic knows whether he is skillful or not, and he ought to take a pride in his abilities, asserting a manly independence when occasion requires, in justice to himself and his fellow-workmen. He will get along just as well, and better, too.

I once broke a nice steel punch which had been made for a special purpose. I was very sorry, and was sadly looking at the pieces when I was told to hide them away, or the "old man" would give me "particular fits." This did away with my sorrow. I would not be a skulker for anybody, and in this frame of mind I found the old man in the blacksmith shop, told him what I had done, and gave him the broken punch. He threw it amongst the scrap steel, and said, "Now we know where it is, and will not spend an hour in looking after it when wanted." Q. K.

Cincinnati, O.

The Howe Automatic Band Saw Filing and Setting Machine.

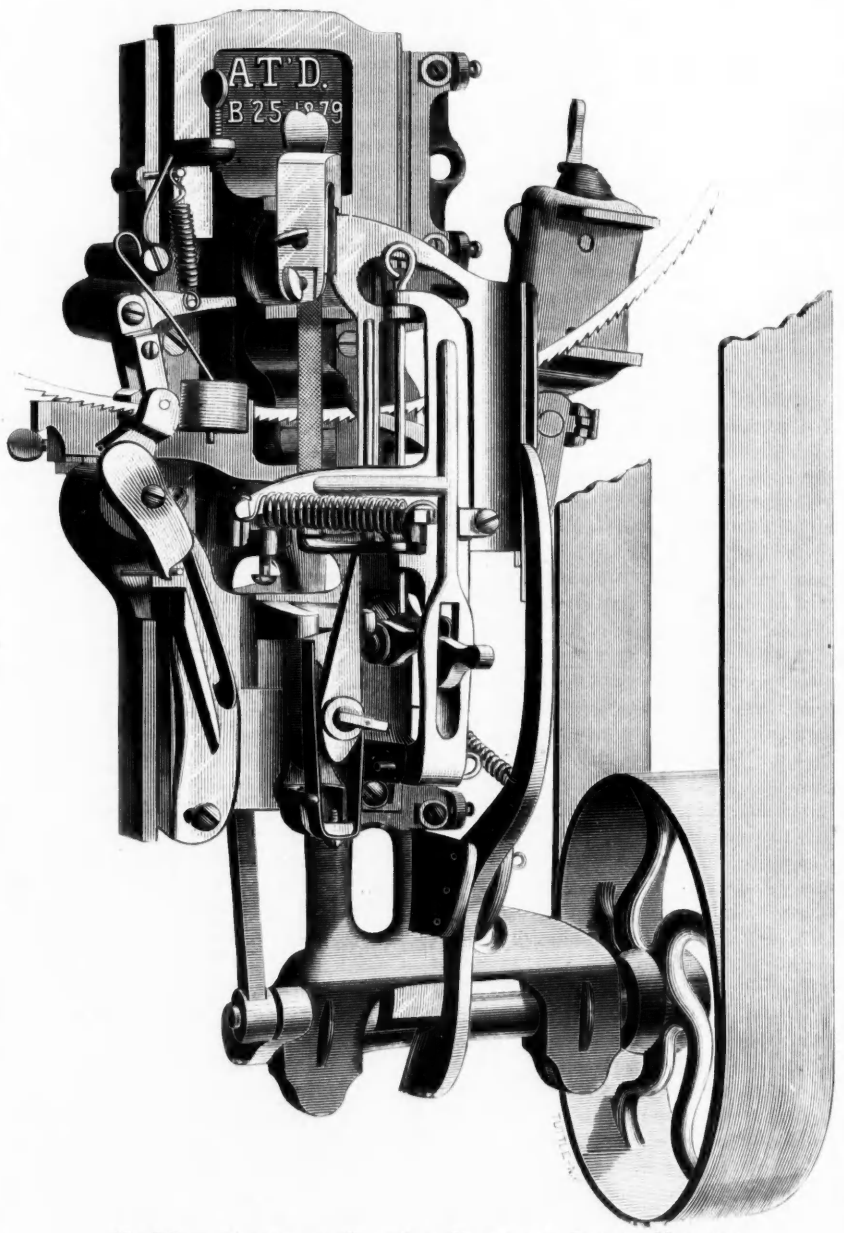
The accompanying engraving gives a perspective view of a very ingeniously contrived and skillfully arranged machine for doing work that has been hitherto considered too complicated for anything beyond hand operating. The principle employed in the construction of the machine is to make it do the work of filing and setting saws in the same way as when the work is done by hand. In performing its functions the machine retains the most valuable features of hand work, while it produces the mechanical accuracy due to unyielding machinery. Three-cornered straight files are used just the same as hand files, and the motion closely imitates the action of a hand operator.

The machine consists of an iron frame carrying a slide operated by a crank driven by a shaft on which is fastened the power pulley. The file holder is attached to this slide and receives its motion therefrom. An automatically worked vise is held on the frame, which grasps the saw and holds it solid to prevent bending or twisting of the saw while each tooth is being filed or set. Another device applies and regulates the pressure of the file, then the file is raised up on the return motion so to clear the teeth of the saw. Other appliances operate the setting dies and regulate the amount of set to be given to the teeth, while the position in which the file travels to give the proper bevel to the tooth is automatically controlled by the operator. In short, all the manipulation needed to file hand-saws of different sizes and the teeth into different shapes, are provided for by the machine.

To put it in position for operating, the machine is fastened by bolts to an upright post (not shown in cut) in any convenient place for connecting it by a belt. The saw is hung loose on rollers on a bracket or cross-bar attached to the post above the machine, so as to retain it in a position to readily pass through the machine, as shown in the engraving. The machine appears with a section of the saw between the jaws of the vise with the file-holder and file in place ready for work. When power is applied, the files sharpen a tooth, then the vise jaws open and the feeder moves the saw along the required distance, when the vise clamps the saw again and the cycle of work goes on till the saw sharpening is finished. The machine was invented and patented by Wm. H. Howe, and is sold by H. N. Green, corner of West 63d street and the Boulevard, New York.

The New England Manufacturers' and Mechanics' Fair, at Boston.

The progress of this exhibition, which, by the way, is called in Boston "The Great American Exposition," the more emphatically to distinguish it as without connection with the foreign exhibition now being held, has been materially delayed by the slowness with which exhibitors have placed their exhibits. Although open for nearly a month, it is now no more than fairly under way, and goods, machines, and machinery are added every day. While the exhibits are numerous, and good in their way, there is a feeling amongst the best friends of the institution, that the Fair does not as a whole come up to the popular idea of what it should be—that there is about it too much of the character of the salesroom show and too little of an exposition of progress. The attendance is by no means large, in fact it is quite the reverse, and one of the undoubted questions of the future, connected with the permanency of the Fair, which the management must solve, is how to increase and maintain the interest of exhibitors and visitors. As a result of the small attendance and indifference, the former are not interested, many of them scarcely putting in an appearance. This is particularly true with reference to strictly mechanical appliances, although the exhibits of such appliances are the best of any at the Fair, and of more interest than any, to those who come for profit. But this class of visitors is generally composed of busy people, who expect to see something new rather than such things as may be seen every day in almost any machinery warehouse. Not that these standard things do not have an interest, but that this interest alone is not sufficient to induce busy people to visit fairs. After all, the majority of visitors at any exposition of the character of this one, are prompted more by feelings of curiosity than by any other, and their tastes must be consulted, so that planning for a successful industrial exhibition is not an easy matter. Many prominent New England manufacturers are not represented, and many others indirectly, as their products appear in the lists of general dealers in machinery and supplies. There are less impossible or chimerical ideas represented than is usual—that is, in the mechanical line—the majority of things shown possessing undoubted merit.



The Howe Automatic Band Saw Filing and Setting Machine.

Glancing at some of the exhibits, amongst those of Hill, Clarke & Co., are machine tools by a number of prominent builders, but with most of which the readers of the American Machinist are already familiar. A chucking lathe, by A. M. Powell & Co., of Worcester, Mass., deserves a word. This lathe has a 50″ bed, 24″ swing, and, as we heard it expressed, looks like business. It has what might be called a continuous box-bed, extending from the ways almost to the floor, with the merest apology (in height) for legs. It is strongly back geared, and a 4″ belt on a large cone drives a heavy spindle. The dead spindle has power feed, driven by belt and a peculiar endless chain, and connecting through worm wheels. The spindle has quick return, and a swinging drill rest with steel jaws is very quickly adjusted. Altogether, the tool looks capable of heavy and rapid work.

A Knowles key-seater, shown by the same firm, consists of a horizontal bed, upon the top of which works a horizontal slide. The top of this slide is a rack, and a boss on the end takes the tool-holder or cutter-bar, and the whole is driven by gearing to the rack mentioned. The work to be key-seated is fastened to the end of the machine. The shifting motion is quite similar to that of a planer, and the length of stroke is quickly adjnsted.

Hill, Clarke & Co. also exhibit an 8″x10″ Payne automatic engine, and a 14″x24″ Cummer automatic engine, the latter in motion.

The Consolidated Safety Valve Company show some of their more recent styles of "pop" safety valves, amongst which we notice a relief valve for the steam chests of locomotives, and a "snifting" valve for relieving the cylinders of steam engines of water. This latter is ingeniously constructed so as to present the least possible obstruction to the escape of entrained or condensed water, and suggests the saving of cylinder-heads from destruction.

In the display of the Ashcroft Manufacturing Company are several of the Moscrop continuous speed recorders, and quite a number of these instrument are shown in operation in connection with different steam engines where they attract a good deal of attention. It seems to be believed, that these recorders are more generally applicable than has been commonly appreciated. Thus in addition to continuously indicating variations in the speed of a prime mover—whether an engine or a water-wheel—they can be placed in any or every room in a large manufacturing establishment, where they will unfailingly indicate any irregularity of motion in the shaft, an irregularity that may be caused by something entirely outside the engine room. One of them can be easily moved from place to place, and quickly connected with a machine where it will register the slipping of a belt, or other cause that deranges the motion. It would appear as though valuable use would suggest itself for one or more of these instruments in almost any manufacturing establishment, if for nothing else than to detect slipping belts and point out the remedy for it.

The Economy Supplies Company control the exhibits of a large number of tool builders, representing almost everything used in the machine shop large or small. Noticeable amongst their exhibits, is a new lathe by W. C. Young & Company, of Worcester. This is a very neat, small lathe, 10″ swing and 3½ feet bed, designed for sewing machine work, and work of a similarly light character. It is back-geared and screw-cutting.

In the space of this company the Billings & Spencer Company show some remarkably fine specimens of drop forgings. This is really one of the most instructive exhibits to be seen. The forgings are shown, many of them both finished and unfinished, but the instructive feature belongs particularly to the unfinished product. The fact that small forging of the most intricate character, such as prices of gun locks, all kinds of sewing machine work, parts of guns and pistols, dies and screw plates, handles, wrenches, in fact any small forgings—that as made by the blacksmith in tedious time are machined into shape and finished at a good deal of expense—can be cheaply drop forged, and duplicated and reduplicated so accurately that it seems too bad to finish them at all, ought to have made more impression on the cost of special—even on general—machine work than it has. Such a display as that made by the Billings & Spencer Company is valuable as a means of education. This company also show in the same space many of their special finished tools.

Amongst the smaller things that are looked upon with interest is the Humphreys belt fastener, shown elsewhere in this issue of the American Machinist. Mr. Humphreys, who is a practical mechanic, has secured the privilege of fastening together some of the most important belts in the building with his fastener, amongst others a 12″ and two 6″ very heavy double belts running at high velocity and driving dynamo electric machines for lighting the room. They are highly spoken of by those who use them for this purpose.

J. Torrey & Sons, Philadelphia, show their enamelled water-line glasses, which suggests an inquiry why they are not more generally used. There may be some good reason for it, but on the face of the exhibit it looks—as it has looked before—as if the evidence was in their favor. These glasses are enamelled inside for their entire length and for about one-third their circumference. This enamelled part is placed at the back side, and seen through the glass the water looks about as white as milk, so that the height of the water in the glass is readily seen, and at quite a distance; at least that is the case when the glasses are new.

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NEW YORK, OCTOBER 13, 1883.

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The Truck Pay System.

Early in this century, when many of the manufactnring industries of Great Britain were in their infancy, a system of paying employes in goods grew up side by side with the factories and mills that reared their chimneys in every vale and river bank. The character of "tommy shop" goods became a by-word of reproach, a synonym for anything that was inferior. Wits satirized the system by which manufacturing establishments were able to keep down their workpeople while starving and poisoning them with their monopoly in buying cheap and selling dear; the operatives hated and despised the hold that kept them poor and moneyless, and statesmen perceived that the "truck system," as it was called, demoralized the workmen and discouraged habits of thrift and self-dependence. Those who had the interests of the wage-workers at heart began a persistent agitation against the truck system, and it took many years of determined exposure of its evils before the law-making power moved to inquire into the matter. Parliamentary committees and royal commissions successively inquired into the working of the truck system, and although, like other monopolies, it had many influential friends, the decision arrived at was that the truck system must go. No canker on the body politic ever showed more persistent vitality than the truck system. It took several acts of Parliament and amendments of acts, besides prompt executive action, before the iniquitous system was grubbed out root and branch.

Repudiated by Britain as too tyrannical and demoralizing, this truck system was transplanted to several of our free States, where it has grown and flourished. In the great industrial State of Pennsylvania it became so obnoxious that legislative action made it illegal. As was formerly the case in Britain, those who profit by this iniquitous way of money-making have been struggling to evade the law. Owners of factories cannot any longer keep stores openly connected with the works and merely pay the men the balance of wages left, after the habitually extortionate prices for goods supplied have been deducted. But they become "interested" in a store, and an unmistakable hint is given to the workman that it will be good for his interests to trade there. In prosperous times the majority of workmen will not be much influenced against their own financial interests by even the strongest hints, but when work is scarce a great many men fall into the net rather than face the prospect of being the first to get discharged. And a certain weak class of men, with no independence, will at all times truckle for favor by placing themthemselves under the trammels of the truck store. These are the men who need the most protection from the strong arm of law, because they have no capacity for protecting themselves. If they were the only sufferers, individually, we would have very small sympathy for them, but their families bear the greatest part of the burden, thrown upon them by unscrupulous corporations, who are not satisfied with the legitimate profits of their business.

Several suits have been brought in Pennsylvania by workmen who traded at their employers' stores, to have the money paid for the goods refunded. We have no sympathy for a man who is so deficient of independence as to trade at a store against his will and then try to sneak out of his obligations to pay, but we wish strongly to protest against the practice of systematically violating a law which is a very necessary protection for the weak.

Jumping into Farming.

John Roach, in his examination before the Senate Committee on Labor and Education, gave it as his opinion that the correct panacea for the wrongs of labor was for the Government to grant one hundred and fifty acres of land to men who were willing to enter upon its cultivation. He seemed to think that were this benevolent offer made, the thousands of book-keepers who are daily parading the streets of New York in search of employment would instantly don cowhide boots and start for Dakota; that our mechanics out of work would hurry off and turn their straight-edges into plowshares, and their calipers into pruning-hooks. Had Mr. Roach inquired a little further into the matter he was so ready to elucidate, he would have found that the Government is already more liberal in dealing out land than what he expected would produce an industrial millennium. Any man can get one hundred and sixty acres of land if he will become an actual settler, and a like area of land can be claimed by his wife and each of his children over a certain age. But taking up land is like starting up ship building, it requires capital and some acquaintance with the work of land cultivation. If Mr. Roach would go out to a Dakota prairie without money, friends, or implements, and spend a season there turning wild land into smiling wheat-fields, he would then be in a position to invite the unemployed to go and do likewise. Till he succeeds in performing some experiment of this kind, the men who are as ignorant of farming as he is may be excused for declining to follow his recommendations.

How an Engineer's Sincerity Inspired Confidence.

An earnest conviction will sometimes go a good ways in convincing others. We heard, not long since, an anecdote of the late Henry R. Worthington that illustrates this rather forcibly and in a manner entirely creditable to human nature. In the early days of the direct-acting steam pump, Mr. Worthington was anxious to build and place a large one for the water-supply of a city, and to that end appeared before the proper board with his plans. There was not at that time much confidence in direct-acting steam pumps for any purpose, and the use of a large one, as for this service, was an untried experiment, but as he was willing to guarantee the required duty and to furnish a pump of the prescribed capacity at a low price compared with the cost of the type of pumping engine used at that time, he was eventually listened to favorably. When everything began to look satisfactory to him, the question of bonds for the proper performance of his part of the contract came up. It was not likely that any one would risk his money for friendship, in an enterprise that had been unanimously condemned by the best engineers of the time, and Mr. Worthington was almost literally without means himself. A wealthy gentleman of the board, however, kept up the conversation in which Mr. Worthington further explained his plans and his convictions of success, and in the end this gentleman was himself so far convinced as to rise to his feet and in a forcible manner express his willingness to subscribe to the required bonds. As his name was unexceptionable for the purpose, Mr. Worthington built his first pumping engine, which it is pleasant to relate was credited with a remarkable duty much beyond that guaranteed.

Life-Saving Effected by Mechanical Appliances.

A railroad collision which happened lately at Green Spring on the Philadelphia, Wilmington and Baltimore Railroad, forcibly illustrates how much good mechanical appliances have done to reduce the dangers of railroad traveling. A tramp started the engine of a freight tram at night in the face of an approaching passenger train. The engines were within a few rods of each other before the engineer of the passenger train perceived the runaway. He only had time to apply the air-brakes and reverse the engine when the shock came, and the concussion was so terrible that both engines were smashed to fragments. The passenger train was loaded with passengers, yet no one was seriously hurt. But for the presence of the automatic brake and of the Miller platform that accident would have been a sanguinary massacre. It was more violent than any of the late Long Island Railroad accidents, and the shock was about equal to what caused such disastrous results at Carlyon. What prevented fatal effects at Green Spring was, that powerful brakes held the cars from pounding each other, and strong platforms with proper couplings provided against telescoping.

Literary Notes.

Henry C. Meyer, editor and proprietor of the *Sanitary Engineer*, the most successful journal of its class in the world, has recently returned from a trip to Europe. While in England he was urged to issue a European edition of his journal. He assented, and accordingly made arrangements by which the *Sanitary Engineer* will be published every Thursday in London, the date of its issue being two weeks later than in New York. An attractive colored cover will contain advertisements especially for foreign readers. The publishers guarantee for the next year a larger English circulation than is now enjoyed by any similar publication in that country. This is a commendable stroke of American journalistic enterprise.

THE MACHINISTS' AND STEAM ENGINEERS' PRACTICAL CALCULATOR.—A Compilation of Useful Rules and Problems Arithmetically Solved, together with General Information Applicable to Shop Tools, Mill Gearing, Pulleys and Shafts, Steam Boilers and Engines; Embracing Valuable Tables and Instruction in Screw Cutting, Valve and Link Motion, etc., etc. By D. B Dixon. New York: D. Van Nostrand, publisher, 23 Murray and 27 Warren streets.

The value of a book of the character of this one depends entirely upon its accuracy, and judged by this standard we should say, from a brief examination, that the one with the above comprehensive title would be found conspicuously wanting.

It is almost entirely a compilation from various authors, and while as a matter of course much, that is good is appropriated, there seems in the selection to have been but little or no discrimination between good and bad.

The author intimates in his preface that the work is intended for practical men and apprentices, and apparently proceeded on the somewhat too common assumption that it required little or no knowledge of the subjects treated to give such readers information.

As an instance, at random, the reader is told under the head of "Gearing" that "the thickness of the tooth at the pitch-line is just half the circular pitch."

The rule for working steel is said to be: "Hammer to a polish, harden at a blood-red, temper to a straw-color," no reference whatever being made to the use to which the steel is to be put after tempering, or to what kind of "straw" is referred to. "Cut solid dies with a master tap of the exact size of bolt to be threaded," may prevent some tool-makers using a tap two or three times as large, but how much will he profit by the instruction to "cut split dies with a master tap whose threads are three times the depth of threads to be cut?"

Under the head of "Steam Boilers" and "Steam Engines" is a mass of matter, seemingly collected hap-hazard, and consisting largely of contradictions given in good faith and without the sources from which they were derived. Such lucid information as the following is given:

"To relieve a boiler of steam as fast as generated, allow an area of $\frac{7}{10}$ths of a square inch for lift of valve." Speaking of the lap and lead of a slide-valve, the author says:

"The better practice, however, seems to be to allow no inside lap or lead." A rule is given "to find what amount of lap must be given the steam end of a valve to cut off the steam at any part of piston-stroke," which is illustrated with an example demonstrating that with a 4″ travel of valve and $\frac{1}{64}$″ lead, a lap of .4844″ will cut off steam at $\frac{3}{4}$ stroke. This is perhaps the effect of the author's attempt to change the reading of the rule as generally given for this purpose, and in attempting such changes, as well as in the modification of the wording of definitions, he will hardly be called successful. "It is the usual practice," he says, "to make the area of the exhaust port twice that of the steam ports and twice as long," and the "hills and hollows" in the "curve-line" of an indicator card expose "the shocking condition of the

working of the engine." Explanatory of "How to change the direction of motion of an engine" one plan is given, and after that the following:

"Another and as good a plan is to make a mark on the eccentric and shaft exactly even with each other, and then with a pair of dividers make a second mark on the shaft exactly opposite the first mark, and move the eccentric around until its mark is exactly even with the second mark and fasten it." It is said with reference to this last plan: "It makes no difference in this proceeding where the crank is with regard to stroke of piston," which one may readily believe.

Extracts might be multiplied, if necessary, to show the character of the work, but the above are perhaps sufficient.

The book is well printed, and bound in convenient size (about 3¼x5″) and sells, we believe, for $2.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(320) W. H., Harrisburg, Pa., asks questions about proportions of a slide-valve that cannot be satisfactorily answered unless the length of ports be given.

(321) D. P. S., Buffalo, N. Y., ask: Is it possible for an injector or inspirator to feed a boiler with water 210° or 212° Fahrenheit, if the water flows to injector or has two or three feet head? *A.*—The highest temperature that any kind of injector can be relied on to take up water is about 150° Fahrenheit.

(322) J. E. O., South Boston, Mass., asks: Why in a compound engine is the second cylinder the largest? I should think that the large cylinder should be the one into which the steam is admitted when hot and of high-pressure? *A.*—If you will consider that the forward pressure on the second cylinder will not be more than the back pressure on the first cylinder, you will be able to see one important reason for making the second cylinder the largest.

(323) I. L. Boston, New York, writes: Please explain the meaning of the term "diametral pitch," and its relation to circular pitch? *A.*—The circular pitch of a gear-wheel is the distance from center to center of two adjoining teeth, measured on the pitch line. The diametral pitch is a term made use of to express the number of teeth in a wheel for each inch of its diameter. Dividing 3.1416 by either of the pitches (the diametral or circular) will give the other.

(324) X. Y. Z., Pittsburgh, Pa., asks: 1. Will you give me the names of a few schools where I can study civil engineering? Rensselaer Polytechnic Institute, Troy, N. Y.; Union College, Schenectady, N. Y.; Yale College, New Haven, Conn.; Lehigh University, Bethlehem, Pa., and various other institutions. 2. It will be about a year before I can enter. What books should I study during that time? *A.*—We should advise that you find out the qualifications from the institute you propose to enter, and be governed in this respect by that knowledge.

(325) H. W. E., writes: Being a tool maker I have a great many straight gas-pipe taps to make. Will you give the standard sizes of gas-pipe threads from ⅛″ to 2″? *A.*—We copy the following from "Steam Heating," a little book by Robert Briggs, just published by D. Van Nostrand, 23 Murray street, New York. It is under the head of "Straight Sockets for Coupling Wrought Iron Tubes," and seems to meet your case:

DIAMETER OF TUBE.	DIAMETER OF SOCKET BEFORE TAPPING INSIDE.
Inch.	Inch.
⅛	0.333
¼	0.431
⅜	0.566
½	0.699
¾	0.909
1	1.143
1¼	1.487
1½	1.726
2	2.201

(326) C. M., Galveston, Tex., asks: 1. Is the water that goes overboard in a surface condenser fresh or only that from the hot well? *A.*—Only that from the hot well. 2. What is the principle of a keel condenser? *A.*—In a keel condenser the steam is condensed by the water in contact with the pipe, without the use of a circulating pump. It is a kind of surface condenser. 3. How can I tell when it leaks? *A.*—If it leaks the pipe will fill with water when you are not running. 4. What is a jet condenser? A jet condenser is one in which the steam comes in contact with the condensing water.

BUSINESS SPECIALS

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Match Machinery, F. Chillingworth, New Haven, Ct.

F. VanWinkle, Mech. Engin'r, 22 Cortlandt St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N.J.

Portable outfits for making rubber stamps. Address The Barnes & Allen Mfg. Co., Syracuse, N. Y.

Improved Tack Machines,
Taunton Cotton and Machine Co., Taunton, Mass.

The latest Improved Match Machinery is made by the White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh Wells, & Co., corner Fulton and Dutch streets, New York.

Consulting Engineer and Mechanical expert, C. C. Hill, 144 LaSalle street, Chicago, Ill.

Chas. T. Porter, Mechanical Engineer, Tribune Building, (Room 58,) New York City.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

For sale, lathes of best designs from new patterns. George A. Ohl & Co., E. Newark, N. J.

Patents.—Franck D. Johns, Att'y at Law & Solicitor of Patents, 617 Seventh St., Washington, D. C.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

William J. Baldwin, consulting engineer in Steam Heating and Ventilation. Author of "Steam Heating for Buildings." Office, 96 Fulton st., New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Young men wishing to take a mechanical course or learn the machinist's trade, call or address School of Mechanical Instruction, No. 195 Front street, Worcester, Mass.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant. $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

BOUND VOLUMES of the AMERICAN MACHINIST for 1880, 1881, and 1882. A limited number of each sent by express for $4 per volume, express charges to be paid by purchaser. AMER. MACHINIST Publishing Co., 96 Fulton st., New York.

"HOW TO KEEP BOILERS CLEAN."—A book of seventy-two pages, telling how to prevent scaling, foaming, priming, and burning, with other valuable information, will be sent to any address FREE of postage, by James F. Hotchkiss, 86 John street, New York.

Any of our readers who have complete files of Volumes I. and II. in good condition, bound or unbound, can probably find a purchaser by addressing us, and stating the lowest price they will accept. AMERICAN MACHINIST PUBLISHING COMPANY, 96 Fulton street, New York.

Slide valve working models, $2 each. Full size working drawings for making same, 25 cents. Shows effect of lap, lead, expansion, cushion, &c., at a glance. Will forward on receipt of money or stamps. Also "Useful Hints on Steam," 96 page book, mailed for 15 cents. E. E. Roberts, manufacturer of engines and boilers, 107 Liberty street, New York.

Chordal's Letters.—John Wiley & Sons, 15 Astor Place, New York, have now ready a new and enlarged edition, with six additional plates, of Chordal's Letters, comprising the choicest selections from the series of articles entitled "Extracts from Chordal's Letters," which have appeared in the columns of the AMERICAN MACHINIST; with a steel portrait of the author, and upwards of fifty original illustrations by Chas. J. Taylor. One volume 12 mo. of nearly 400 pages, cloth, $2.00. Will be mailed and prepaid on the receipt of the price.

MANUFACTURES.

P. Reily, 3 College place, New York, is about to put in an 80-horse power boiler.

The Snake Hill Penitentiary, Jersey City, N. J., is about to put in four new boilers.

The Medant Pulley Company of St. Louis, Mo., are making 150 pulleys a day to meet the demand.

Lewis Moore, No. 25 Van Dam street, will erect a four-story brick shop at No 20 Clark street, New York.

James Everard will erect on 133d street, near Madison avenue, New York, a brewery at a cost of $125,000.

N. Ward & Co., Boston, Mass., will build a glue factory, one building being 55x10 feet and another 20x20 feet.

Hawley & Hoops, 147 Chambers street, New York, are about to put in a new eighty horse-power boiler.

Leo Schlesinger, Eleventh street and Avenue D, New York, will have a new manufactory of tin toys on Crosby street.

The Davis Wrought-Iron Wagon Company of Elmira, N. Y., have plans ready to build new and extensive shops.

H. C. & J. H. Calkin, corner Beach and West streets, New York, will erect a 4-story brick factory at 137 Christopher street.

The Shickle, Harrison & Howard Iron Company of St. Louis, Mo., are to erect a pipe foundry, the building to cost $20,000.

The shops of the Hannibal and St. Jo Railroad were recently burned at Hannibal, Mo., throwing 250 men out of employment.

The Baldwin Locomotive Works have just shipped twelve engines for Brazil. Workmen accompanied the engines to put them together at Rio Janeiro.

A general machine and jobbing shop has lately been established at Quincy, Ill., under the management and proprietorship of Henry Lechtenberg.

The Pond Machine-Tool Company of Worcester Mass., are getting out a new cutting-off machine that will cut-off and center both ends of a 6″ shaft at the same time; also a new pulley lathe.

The Grant & Bogert Machine-Tool Works of Flushing, R. I., are getting out a new 16″ swing lathe which will be geared 16 to 1. Six of these lathes have already been ordered.

The E. & G. Brooke Iron Company of Birdsboro, Pa., have commenced erecting the foundation walls for a new machine and smith shop in the rear of the car-shop at their blast furnaces.

The De La Vergne Refrigerating Company of 157 Bank street, N.Y., are getting out a new illustrated catalogue of their machines. They contemplate extending their manufacturing facilities.

B. M. Payne & Sons, of Corning, N. Y., will soon remove their steam-engine building business to Elmira, where large shops are now being erected for them for which 350 men will be employed.

Hammond & Coon, boiler manufacturers, Buffalo, N. Y., are to add the building of steam engines and machinery to their business. Next spring they will build a machine shop 150x60 ft. and a foundry 60x80 ft.

The Terry Manufacturing Company of Horseheads, N.Y., (door-hanger manufacturers) find their new shop too small for their business, and will build additional shops next season. They employ 25 men.

North Brookfield (Mass.) has belied its name by becoming so dry that water has sold there this fall at 25 cents a barrel. Water for use in the mills and for household use is hauled from a distance in tanks on railroad cars.

The North Chicago (Ill.) Rolling-Mill Company have decided to build a $100,000 nail-mill at Bayview, and will employ 600 men. The building will be put up at once, and the first nails made and delivered by January 1, 1885.

The Leavy & Brittan Brewing Company have purchased a lot of land (110x112 feet) on the southeast corner of Jay and Front streets, Brooklyn, N.Y., for $20,000. It is understood that an extensive brewery will be erected there.

A company has been organized at Glen Rock, Pa., entitled the Glen Rock Manufacturing Company, for the purpose of manufacturing agricultural implements, engines, &c. Wm. Herbst is Treasurer and Geo. P. Ellis Superintendent. The other officers are not yet chosen.

The Union Foundry and Pullman Car-Wheel Works of Chicago have the contract for furnishing the structural for the large Pullman office building now being erected in Chicago. It is stated that this company is about to begin the manufacture of the Shaw locomotive.

The Pittsburgh Locomotive Works have recently turned out some heavy freight locomotives for the Pittsburgh, McKeesport & Yonghiogheny Railroad that are highly spoken of. One of them is reported to have pulled 110 cars, 55 of which were loaded, over a grade of 15 feet to the mile.

The Pittsburgh & Lake Erie Railroad Company have lately broken ground at Dawson, Pa., on their Yonghiogheny division for the construction of new shops and round house. Their old shops located at that place will be used for the repairing of cars when the new works are completed.

The Hooker-Colville Steam-Pump Company of St. Louis, Mo., will shortly erect a 50x105-foot addition to their works to be used as an erecting shop, and in which they will place a considerable quantity of new machinery, including a trip-hammer and a crane. They are running nights.—*Age of Steel.*

Brehmer Bros., of Philadelphia, are meeting with success with their new method of cutting bevel gear-wheels. G. T. Latta, of Cincinnati, for whom a pair of wheels was cut, wrote that he was highly pleased with them, and expressed regrets that he had not met with their method long ago, as it would have saved him great expense and bother.

Wm. Allen & Sons, Worcester, Mass., will soon move into their new shops, which consist of the property formerly occupied by the New York Steam Engine Company. There are 6,000 square feet of land on which stand one 3-story building 140x40 feet, a boiler shop 200x75 feet, a foundry (now running) 100x60 feet and a blacksmith shop 75x40 feet.

E. E. Roberts, 107 Liberty street, New York, is making a model of valve motion, which represents the complete motion of the essential parts of a steam engine. The valve travel, position of valve, &c., can be readily changed, and different arrangements of valve and ports can be made of paper and attached. The parts are made of wood, which makes the cost nominal. For those who wish to construct their own model, a drawing is furnished for a small sum.

From the Cleveland (O.) general office of the Joel Hayden Brass Company, it is learned that of the 350 employes of the concern who walked out of the works at Lorain September 1, upon notice of a 10 per cent. reduction in wages, 300 returned, and are now working as usual. Those who did not wish to work at the reduced wages were paid to the number of about 40.—*Cleveland Trade Review.*

The Prairie State Match Company, Chicago, Ill., has been incorporated with a capital of $25,000. The corporators are T. S. Albright, M. Wasserman, J. C. Ender, Geo. W. Plummer and Fred Sommer. The business of the company will be the manufacture of friction matches. The incorporators are prominent and wealthy men, and will commence operations at once.

The Eames Vacuum Brake Company of Watertown, N. Y., have published a neat illustrated catalogue of their driver brake for locomotives. The cuts show their varied methods of applying the brake to the drivers of locomotives, and their device certainly possesses the merit of simplicity. Power brakes seem to be getting an acknowledged necessity for all classes of locomotives.

The Denver *Journal of Commerce* says: "The engine and machinery building in Denver the present year will average a million dollars. A hundred crushers and smelters will be produced, and twice as many more hoisters and boilers. Every other article of every-day utility can be produced here as successfully as can be crushers and engines. All it wants is determination, perseverance and patronage."

The Hercules Iron Works of Chicago have issued a new illustrated catalogue of Horig's shears, punching, straightening and slotting machines. The inventor, Julius L. Horig, of Jersey City, N. J., will probably make arrangements with some establishment to manufacture these machines in the East in addition to being made in Chicago, Ill. These machines are used with full success in many large iron-working establishments.

The *National Labor Tribune* says: "In the procession on the last 4th of July, in Fort Howard, Wis., J. Delaney and J. Hughes, of the Eagle foundry and brass works, had two wagons, on one of which was a portable engine and rotary blower attached, and on the other a foundry and cupola. The wagons were attached and the cupalo in running order, with moulders at work; casts were successfully taken off in the street as the procession moved along.

A. M. Powell & Co. of Worcester, Mass., will have 16″, 18″, 20″, 22″, 24″, 26″, 28″ and 30″ swing engine lathes upon the market in the course of a few weeks. They now have patterns ready for the 20″, 26″, 28″ and 30″ lathes. They are now getting out patterns for a 28″ shafting lathe to work four tools at once. It will turn and finish shafting without reversing the shaft. Their new chucking lathe will be fitted with a turret-head having five tools. The turret will have power feed and quick return.

The Watchmaker and Metalworker says that in no other branch of manufacturing industry, the watch making, is there equal encouragement for the investment of capital. The marked superiority of American movements has made for them a reputation which is world-wide, their sale is enormous and the profits large. The demand for American watches is now so great that the half dozen companies controlling the product of the country are totally unable to supply it, some of them being from one to three years behind their orders.

More building is being done at the Plano, Ill., harvester shops than was at first contemplated. A new two-story stone building, 25x50 feet is in process of erection south of the paint-shop, which will be used as dipping or japanning rooms; it will be separate from other buildings and rendered as nearly fire-proof as possible. A new brick building, two stories high, 15x24 feet, to be used for storage of patterns, is nearly completed east of the south end of the new foundry; this is also detached and will be made nearly or quite fire-proof; and in addition the oil-house on the north side of the railroad has been taken down and is being rebuilt two stories high, 16x50 feet, east of the new foundry near their side track; the lower story will be used as a storage for molding sand. The new transept to the machine-shop, 120x60 feet, in place of the old clipping-room, is well under way.—*Industrial World.*

We are in receipt of catalogues from the Union Switch and Signal Company, Pittsburgh, Pa., of their interlocking system of switches and signals, their automatic rail circuit block, drawbridge, crossing and station signaling, and of their frogs and switches. The Union Switch and Signal Company is working in a field that has unfortunately been too little operated upon in this country. A few of our principal roads in their most crowded points are supplied with signals to aid in the safe movement of trains, but the great majority of our railroads are as innocent of station signals as if such a thing had never existed. As to interlocking switches, few railroad men understand what is meant by the expression. The catalogues referred to, shed quite a flood of light upon the subject of signals, and railroad men desiring to obtain information thereon would do well to study them carefully. The catalogues are got out in a highly artistic style. We would advise the Union Switch and Signal Company not to use the æsthetic kind of letters on their signal that they head their paragraphs with, or the trains will have to stop while the engineer and conductor spell out the words.

Machinists' Supplies and Iron.

NEW YORK, September 27, 1883.

The supply business is fair, though not as great as dealers and manufacturers would like to see. As goods are not made up in large quantities, except when wanted, a healthy state of affairs exists in the trade. Those who are holding off before buying in anticipation of a serious break in prices, are likely to be disappointed.

The pig iron market is quiet. Unless the demand soon increases stock will accumulate at furnaces. Prices are: No. 1 Foundry, $21 50 to $22.50; No. 2 Foundry, $19 to $19.50.

In Scotch pig there is but little doing. We quote at the yard: Coltness, $23.25; Glengarnock, $23; Gartsherrie, $23.50; Summerlee, $22.50; Eglinton, $20.50 to $21. Prices to arrive are generally $0.50 lower.

Copper is quite steady, with Lake at 15¼c.—other brands at 14¼c. to 14½c. Lead is quiet at 4.32½c.

Spelter at 8c. to 8¾c. for refined; Silesian, 5c. to 5⅛c.

Tin continues quite firm. Jobbing lots of Banac have sold at 21¾c.; Straits and Malacca, 21⅛c. to 21¾c.; L. & F., 21¾c.

In boiler plate the market is about the same as last week. We quote prices as follows:

Tank, 2¼c. to 2¾c.; Refined, 2¾c. to 2 9-10c.; Shell, 3¼c. to 3⅜c.; Flange, 4¼c. to 4⅜c.; extra Flange and Fire Box, 5¼c. to 5½c.; Siemens Steel Plate, 5¼c. to 6c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Chemist disengaged; iron, steel, phosphate, &c. Sugar a specialty. Good references. Will take foreign position. "Chemist," care AM. MACHINIST.

Wanted—Competent mechanical draughtsman; one having experience in printing machinery preferred. Address, stating qualifications, age, &c., Abingdon, at office of this paper.

Situation wanted as superintendent by a thoroughly practical man; has had 25 years' experience in most all kinds of machinery; best of reference. Address B. W., care AM. MACHINIST.

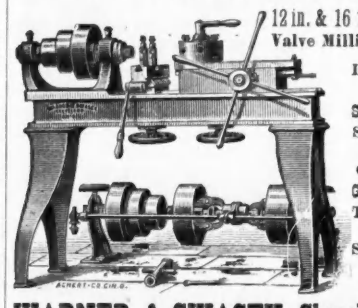
Wanted—Situation as local agent by a gentleman of ability and experience in machinery, tools, engines, &c., in Chicago or Western city; satisfactory references. Address W. A. E., AM. MACHINIST.

Wanted—Parties traveling for other houses and selling to users of steam boilers, to take charge of a small and fast selling article; good references required and the kind of trade solicited. Address "Manufacturer," care AM. MACHINIST.

Wanted—An A1 intelligent, sober machanic to act as foreman; one familiar with steam-engine operation, steam-fitting and hydraulic machinery, can, if satisfactory, obtain a permanent position; persons addicted to drink need not apply. Address "Chicago," care AM. MACHINIST.

Manufacturing property for sale, 30,000 feet floor space, competing point for four trunk lines railroads, switch from door. Write for terms and description B. W. Payne & Sons, Corning, N. Y.

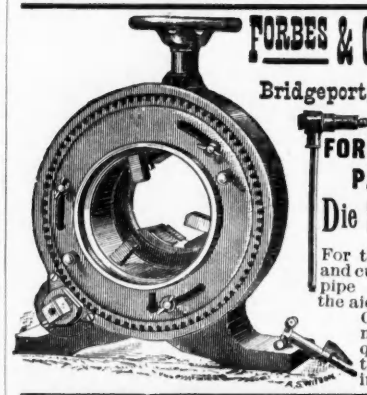
BRASS WORKING MACHINERY.



12 in. & 16 in. Monitors
Valve Milling Mach's
Double Key Lathes,
Speed Lathes
Slide Rests
Revolving Chucks for Globe Valves,
Two-Jaw Chucks,
Small Tools and Fixtures.

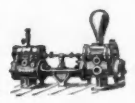
WARNER & SWASEY, Cleveland, O.

UPRIGHT Balanced Spindle, Quick Return.
Drills to center of 11 inches. **DRILLS.**
PRICE, - - $55.00.
LODGE, BARKER & CO.
(AGENTS.)
189 W. Pearl St., Cincinnati, O.



FORBES & CURTIS,
Bridgeport, Conn.
M'f'r's of
FORBES' PATENT
Die Stocks,
For threading and cutting off pipe without the aid of vise. Only one man required to thread 6 in. pipe.

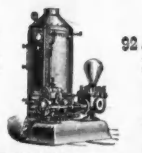
THE NEW PULSOMETER,
The cheapest, strongest, most simple, compact, durable, effective and economical Steam Pump in the market, for raising liquids under and up to 100 feet. No Machinery, No Oil, No Special Care. Can be worked suspended by a chain. Will pass grit, mud, sand, pulp, etc., without injury to its parts. Needs only a steam pipe from boiler to run it. Price, 600 gallons per hour, $50; 1,200 do. $75; 3,600 do. $100; 6,000 do. $150; 10,000 do. $175; 18,000 do. $225; 25,000 do. $275; 45,000 do. $400; 60,000 do. $500; 120,000 do. $1,000. Write for illustrated descriptive book with testimonials, etc. Mailed free. Pulsometer Steam Pump Co., 83 John St., New York.



The Deane Steam Pump Co.

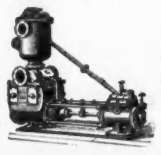
HOLYOKE, MASS.

Send for new Illustrated Catalogue.



92 & 94 Liberty St. NEW YORK. | 54 Oliver St. BOSTON. | 49 N. 7th St. PHILA. | 226 & 228 Lake St. CHICAGO. | 620 & 622 N. Main St. ST. LOUIS.

INDEPENDENT CONDENSING APPARATUS A SPECIALTY.



MANUFACTURE
STEAM PUMPING MACHINERY
For Every Possible Duty.

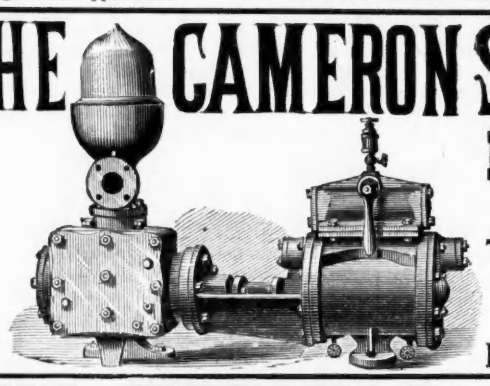
UNION STONE COMPANY,

Patentees and Manufacturers OF THE

UNION EMERY WHEEL.

EMERY, EMERY WHEEL MACHINERY AND TOOLS A SPECIALTY.
Automatic Knife Grinding Machines, Wood Polishing Wheels, Grinders' and Polishers' Supplies.
Catalogues on application. 38 AND 40 HAWLEY STREET, BOSTON, MASS.

THE CAMERON STEAM PUMP.



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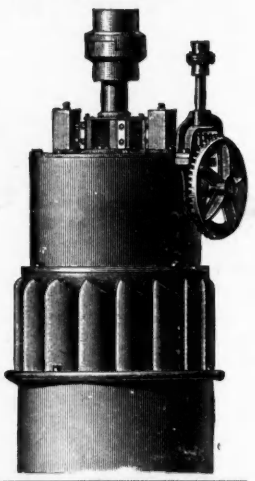

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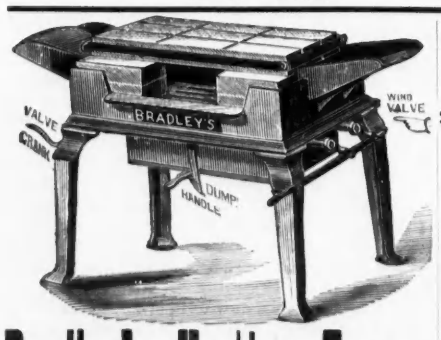

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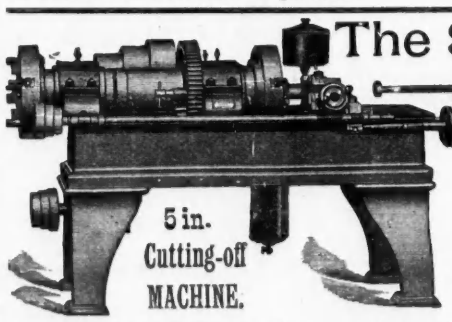

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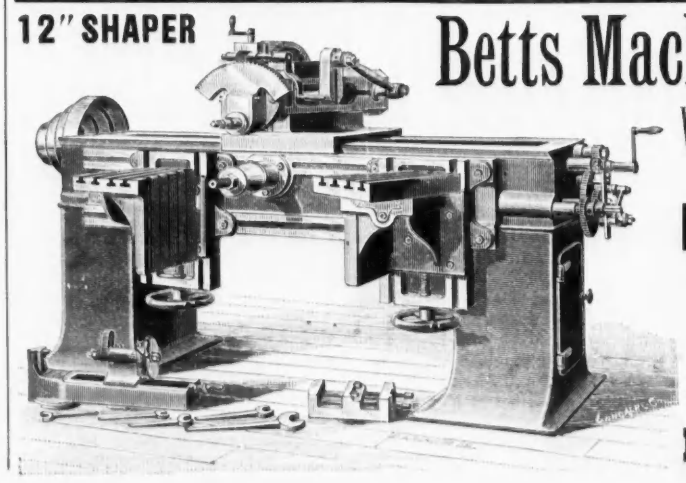

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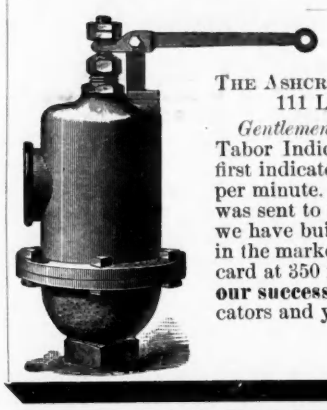

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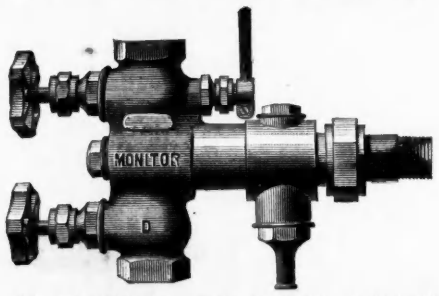

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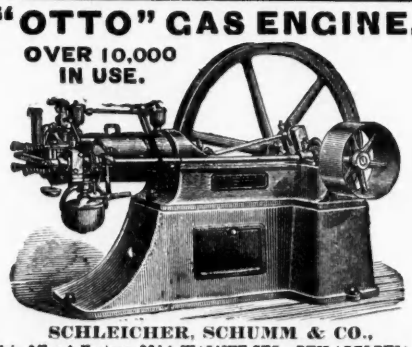

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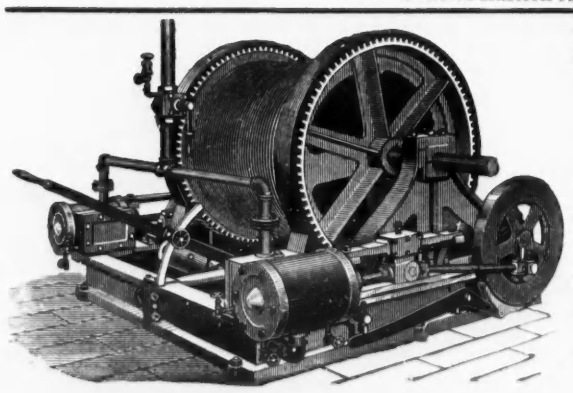

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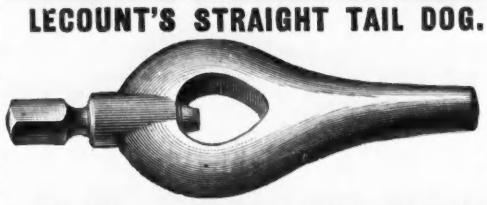

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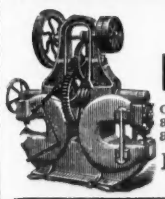

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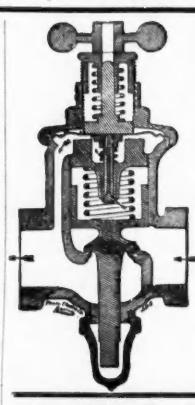

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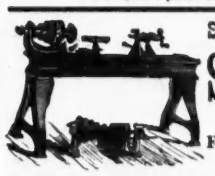

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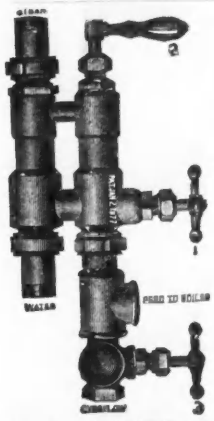

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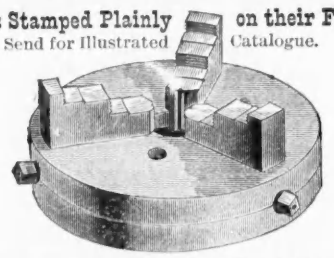

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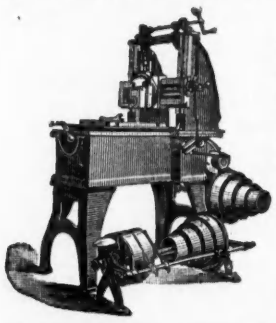

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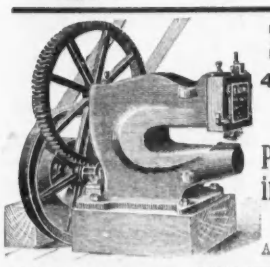

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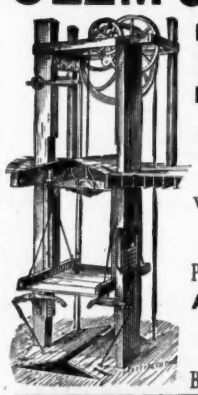

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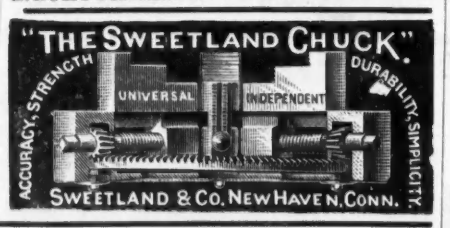

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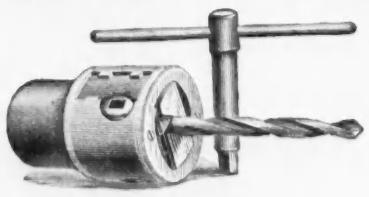

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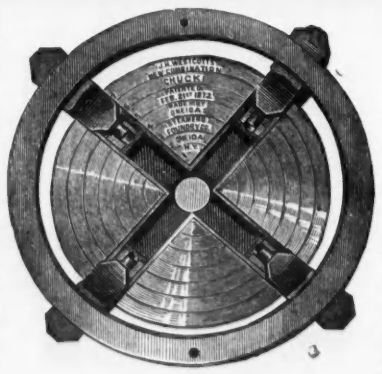

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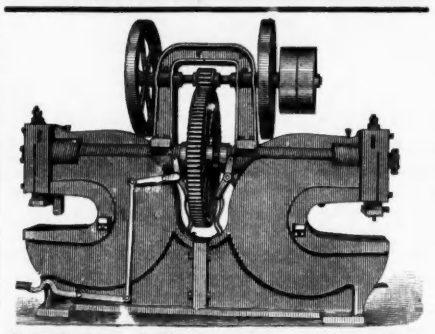

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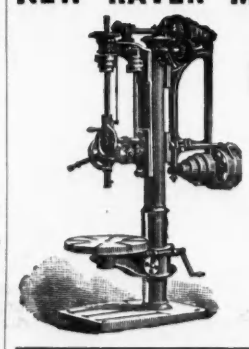

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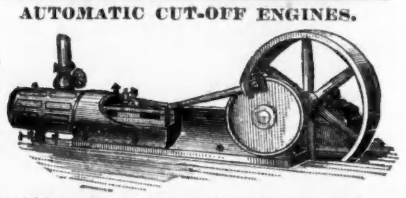

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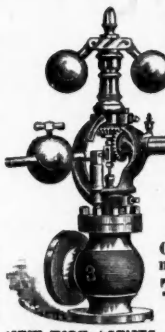

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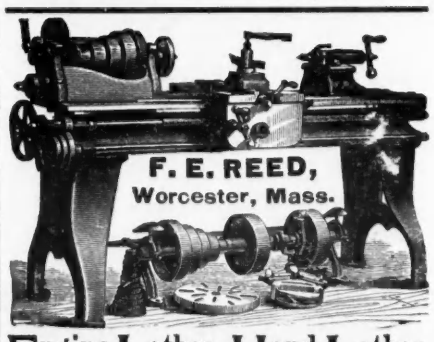

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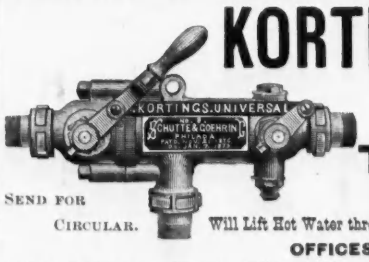

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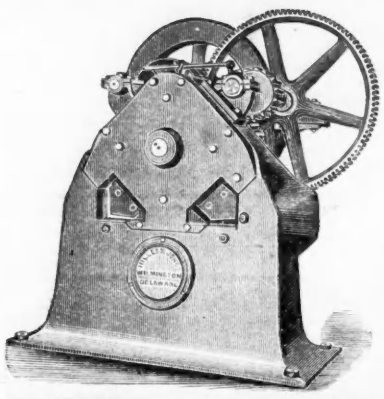

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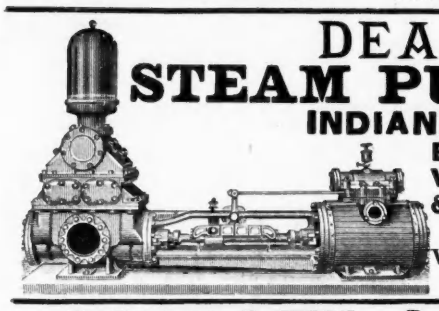

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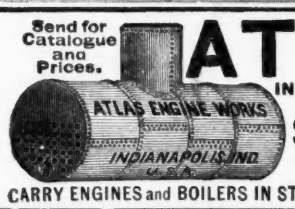

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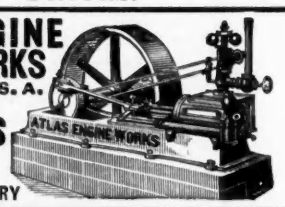

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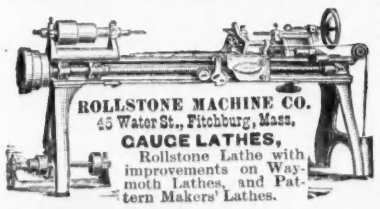

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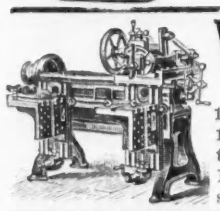

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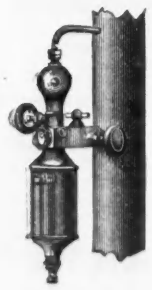

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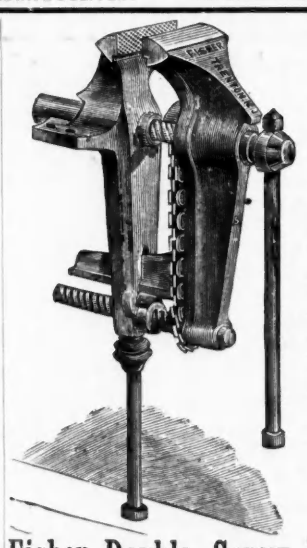

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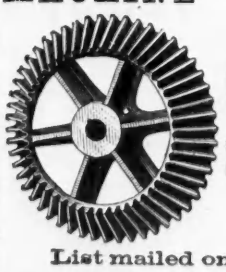

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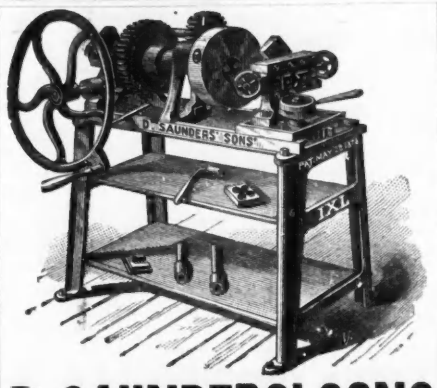

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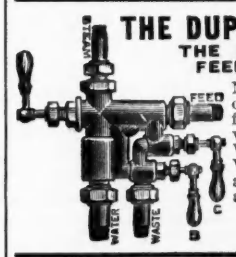

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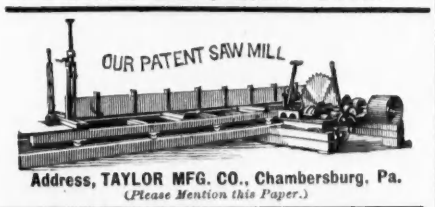

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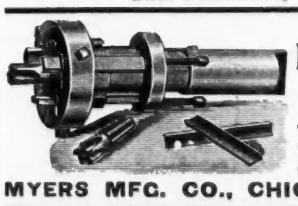

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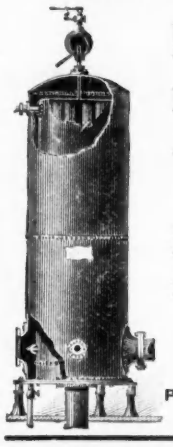

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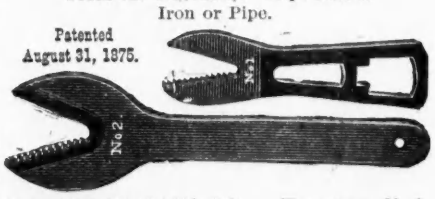

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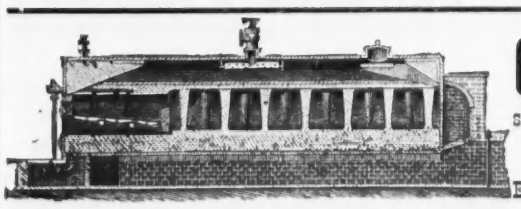

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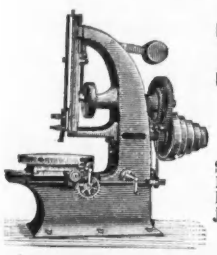

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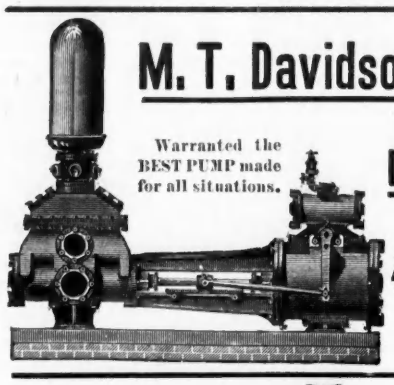

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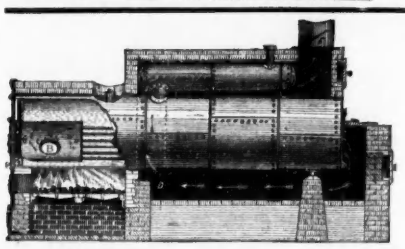

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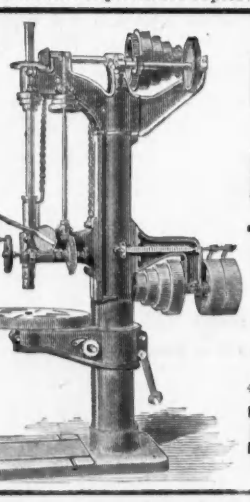

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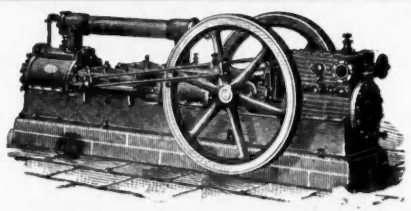

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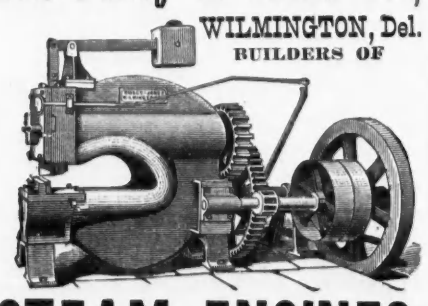

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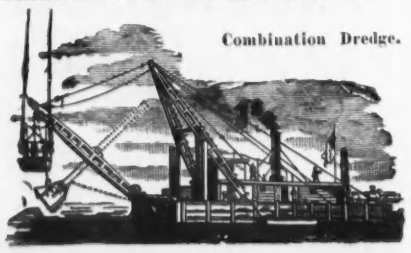

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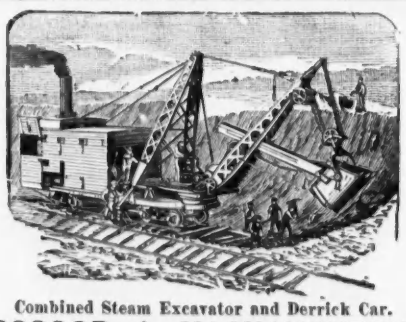

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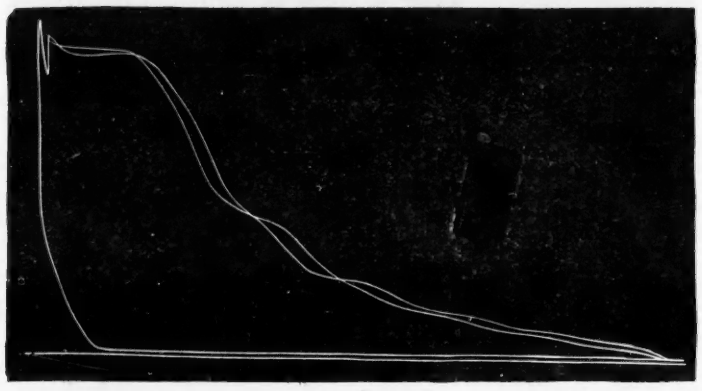

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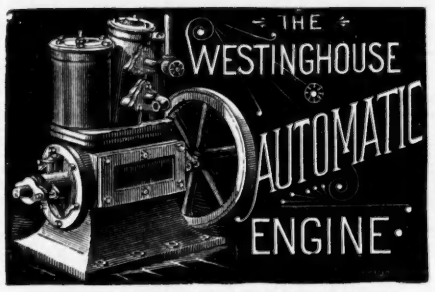

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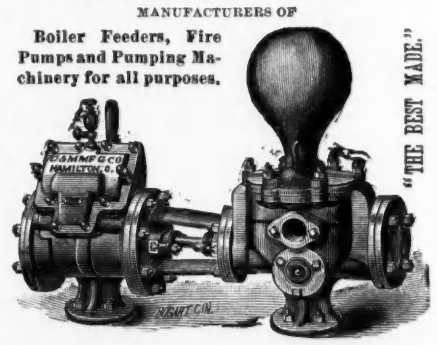

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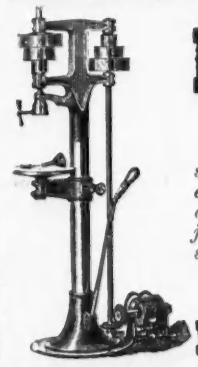

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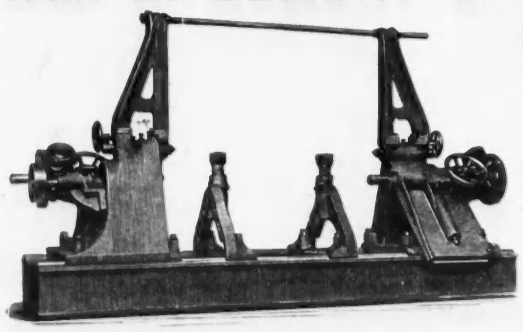

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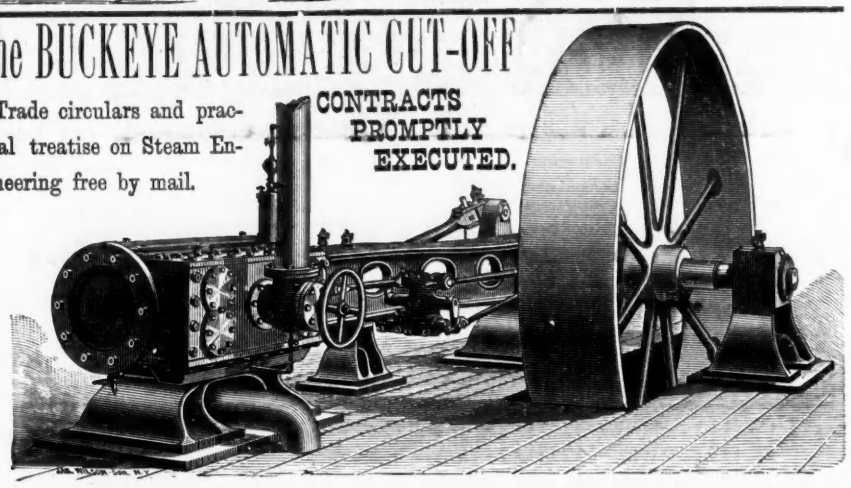

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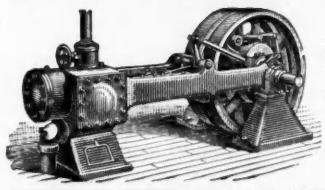

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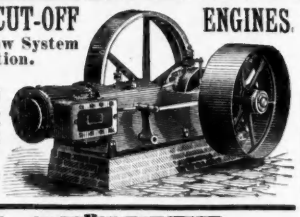

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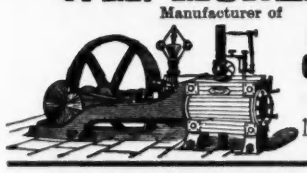

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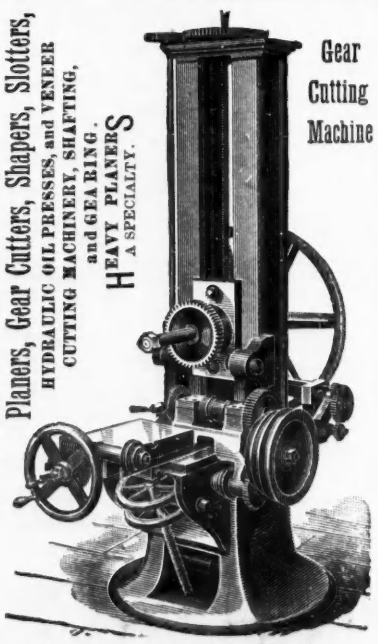

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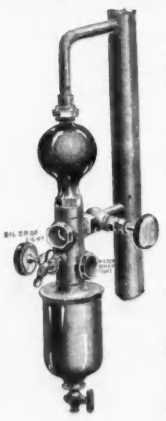

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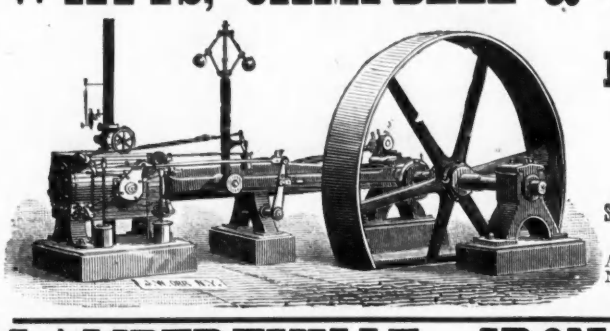

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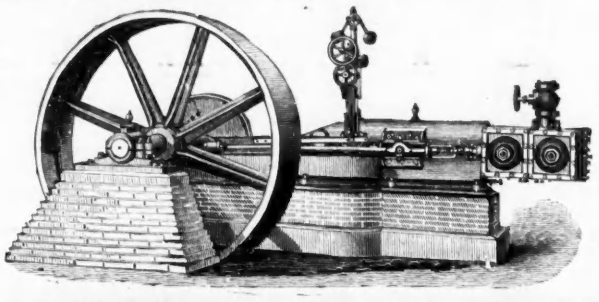

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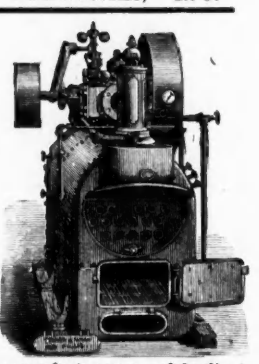

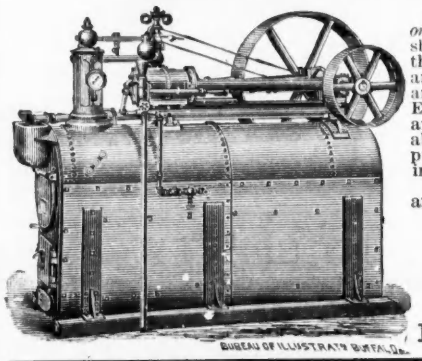

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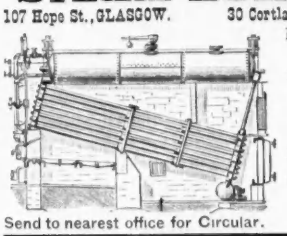

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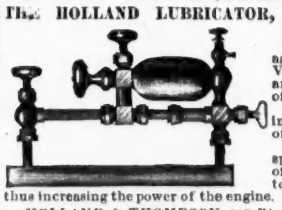

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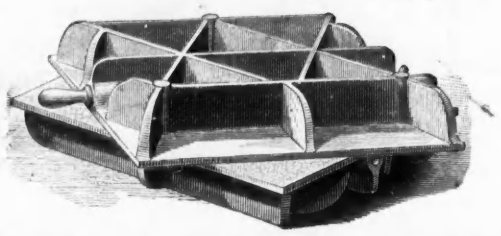

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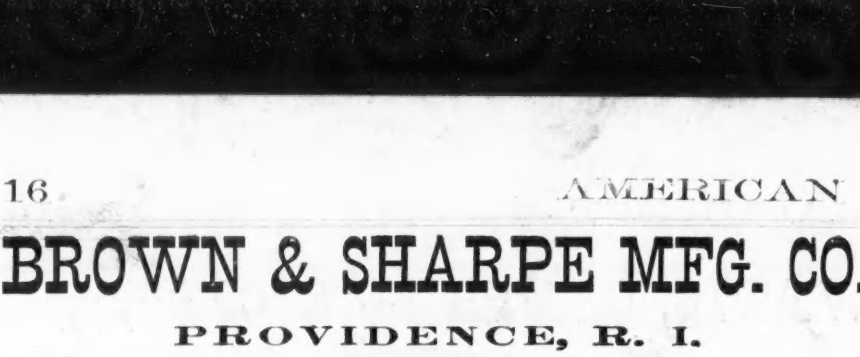

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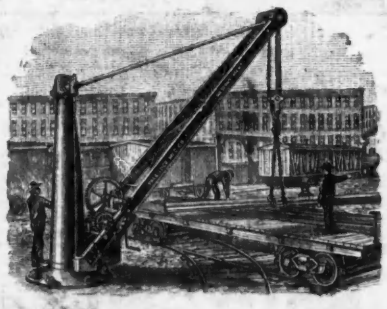

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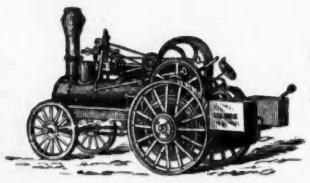

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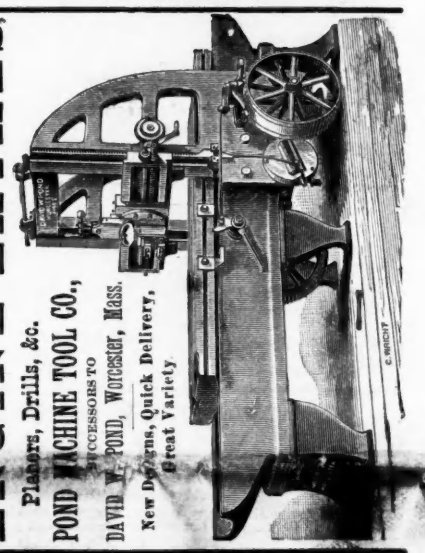

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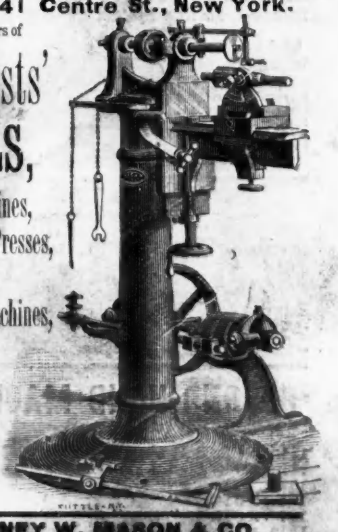

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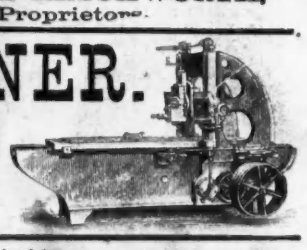

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